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The Greek Revival in Chillicothe, Ohio's Old Capital City

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THERE is something peculiarly interesting about an old city which at one stage of its existence occupied an important position in the history and development of its country. In Europe such cities, because of their historic past, have acquired a note of distinction which has made them famous at home and abroad. In America, however, we have not arrived at that stage of appreciation of our cities and places of historic interest where we give to them more than passing attention. As a country we are so young that it is scarcely realized that we have had a past; we live very largely in the present. In our mad rush of commercialism, and feverish development schemes, important events and places are soon forgotten. A half-century ago Salem and a score of other New England towns possessed far more examples of fine early American architecture than can be found in them to-day, yet they were little appreciated outside of their local community. For a long period we went to England, to France, to Italy, to the classic Roman, and even back to a revival of Greek forms, as a source for a style of architecture, when at home we had what was our national heritage and logical native mode of building, which we now call Colonial.

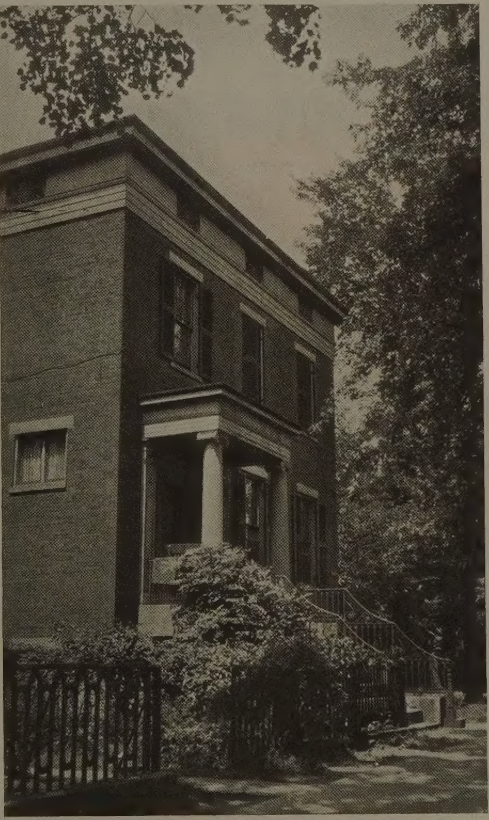


Fig. 1. The Reeves-Woodrow-Fullerton House, S. Paint Street, Chillicothe, Ohio.

Any one of these foreign types might have furnished the basic principles and architectural elements upon which to build or rather develop an architecture of our own, but one style was soon given up to make way for the next, and whatever American characteristics had been infused into one were lost in the taking up of another. It is only within recent years that we have come to a full realization of the value and possibilities of our Colonial and Georgian types as a basis for our future architectural development; at least, for certain portions of our country. After the Colonial, the only sustained early style that held sway in this country for a long enough period to have received an impress of American characteristics was the Greek revival. But, as yet, there are few who will admit that there is anything of value in our heritage of Greek revival forms. In time we may come to recognize, as we have in the case of our Colonial style, that the Greek revival was a definite step, a transitional style, in our architectural development, and that the best remaining examples of it constitute a heritage from which we may draw inspiration for future work.

In the Middle West we can boast of no city as old or containing as fine architecture as Salem. But, just as in New England there were towns which in early times rose to a place of great importance and later were left to slumber when a rival overshadowed them, so also in the Middle West, in the early days of its development, there were towns which rose rapidly to a position of near-fame only to take a second place in the scheme of things as the tide of development swept westward. There were many such in the old Northwest Territory; one of the most striking examples being Chillicothe, Ohio's old capital city. Chillicothe was laid out and settled, in 1796, by Virginians and Kentuckians. The name is of Indian origin, being that of one of the principal tribes of the Shawnees, and also the name of their village located on the site of the modern city. In 1798 a sawmill and gristmill was established on Paint Creek near the town, and following its erection there was a rush of settlers into that section. This mill was erected by Thomas Worthington, who had been appointed by General Rufus Putnam, of Marietta, as surveyor of a large district of Congress lands

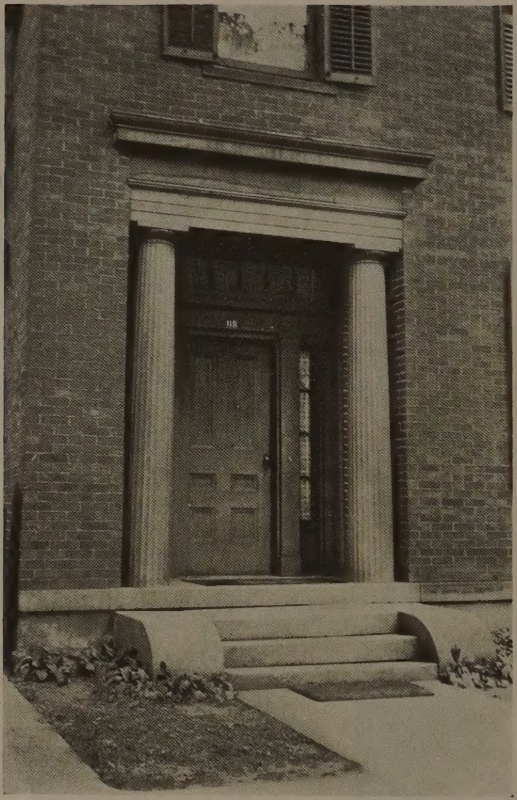


Fig. 9. Doorway of the Morris Renwick house, W. Second Street, Chillicothe, Ohio.

to the east of the new town. In 1799, a post office was established at Chillicothe, which made it a fixed centre of territorial development.

Chillicothe's real importance dates from the year 1800, when the seat of government of the Northwest Territory was removed, by law of Congress, from Cincinnati to Chillicothe. The new State House, which was begun in 1800 and completed in the following year, is said to have been the first stone public building in the Northwest Territory. The convention that framed the constitution of Ohio was held in it in 1802, and the first State Legislature met there in 1803. Chillicothe was the State capital from 1803 until 1810, when Zanesville became the temporary capital, but in the latter part of 1812 it was again removed to Chillicothe, where it remained until 1816, when Columbus was made the permanent capital city.

Thus for sixteen years Chillicothe occupied an important place in the affairs of the new State. It had grown rapidly, and through various promoters was laid out on a large scale. Investors came in, bringing considerable wealth with them, and a great era of building was experienced. From the impetus thus received Chillicothe continued to be one of Ohio's leading cities long after the capital had been removed to Columbus. Most of the fine old residences remaining today are those which were erected, not during the speculative period, but in the more settled period which dates from about 1830 to 1850. It is with the architecture of this period that this article is particularly concerned.

An index to the onetime importance of Salem is her unusually fine architecture of the period. The architecture of Chillicothe cannot compare, in many respects, with that of Salem, but it is just as expressive of the life, thought, and ambitions of the Middle Westerner of the forties as that o the eastern city is of the New Englander and his time. Each marks an important step in the architectural development of America.

The period of Salem's greatest growth came at a time when the Colonial and Post-Colonial were at their height. Colonial precedent was so well grounded there that the Greek revival, which dates generally from 1800 to 1855, had little effect upon her architecture. Salem continued to build largely after her native or early style. But in 1800 Chillicothe was but a primitive town in the heart of the great forests of the Northwest. There was no precedent to follow—all was new. Western towns have always taken pride in being up to date, consequently Colonial architecture, which was considered old fashioned, did not appeal to them. The Greek revival, the new mode of building, which was making its appearance in many eastern cities, was hailed as the appropriate style for giving expression to our "national importance." It was early introduced into the ambitious western town, and after 1830 became the prevailing style for the more important and pretentious buildings. Many examples still remain which give the city a refined, dignified, and aristocratic atmosphere. Unfortunately a great fire swept through the main portion of the town in 1852, and as a result most of the Greek revival buildings of a civic and commercial nature were destroyed, leaving only some of the finer residences to indicate the character of the work here during the period.

Most of the larger brick residences show traces of this style in some of its forms. Many old houses had a "classic" porch added over what was, in reality, a Colonial type entrance. Details, ornament, and mouldings were the first

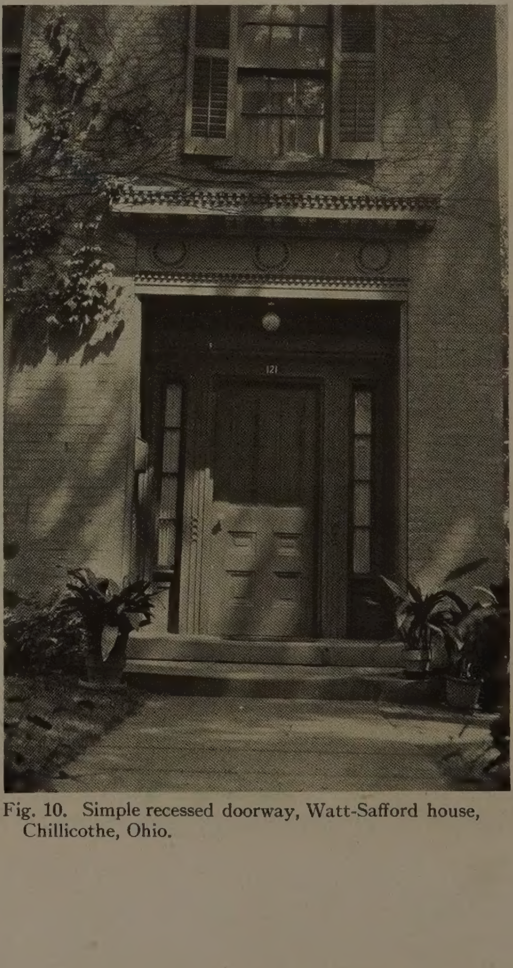


Fig. 10. Simple recessed doorway, Watt-Safford house, Chillicothe, Ohio.

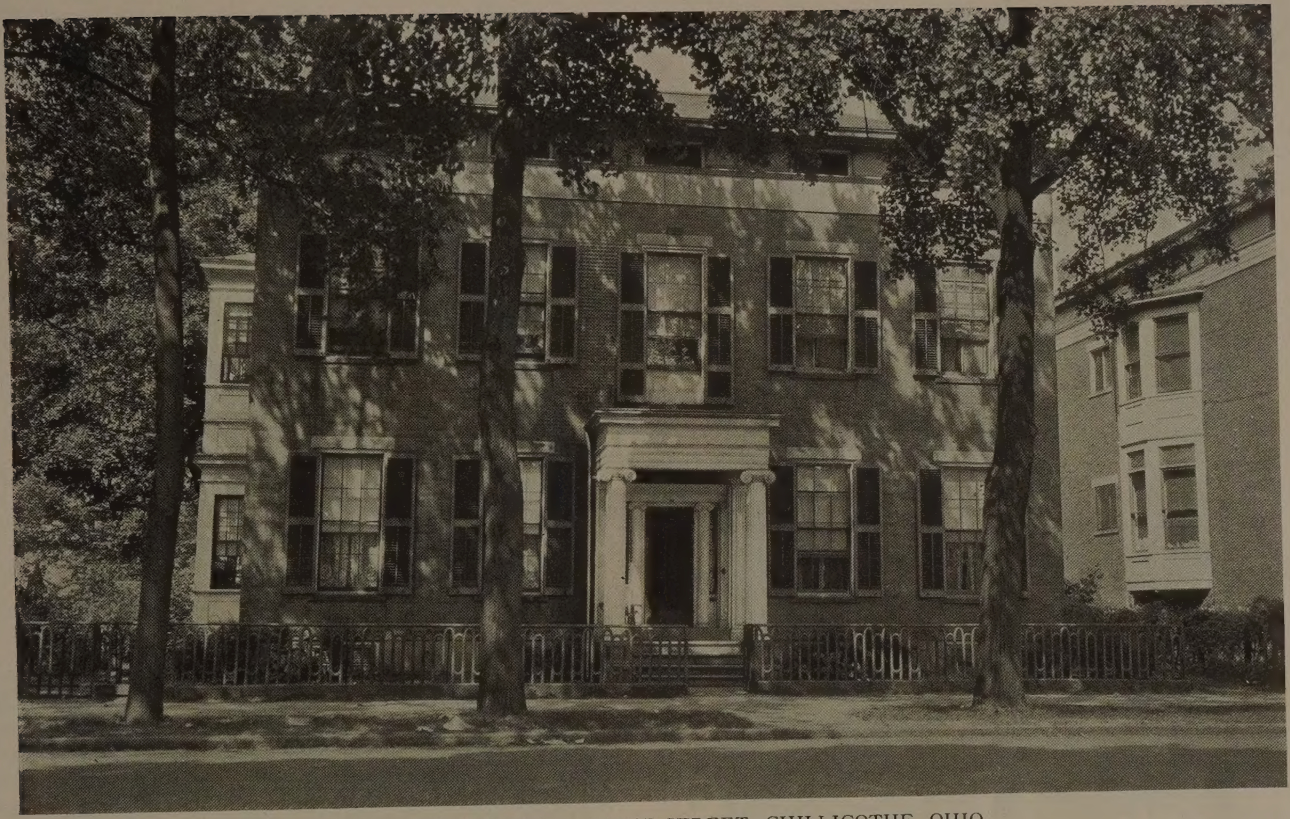


Fig. 2. THE McLANDBURGH–FULLERTON HOUSE, S. PAINT STREET, CHILLICOTHE, OHIO.

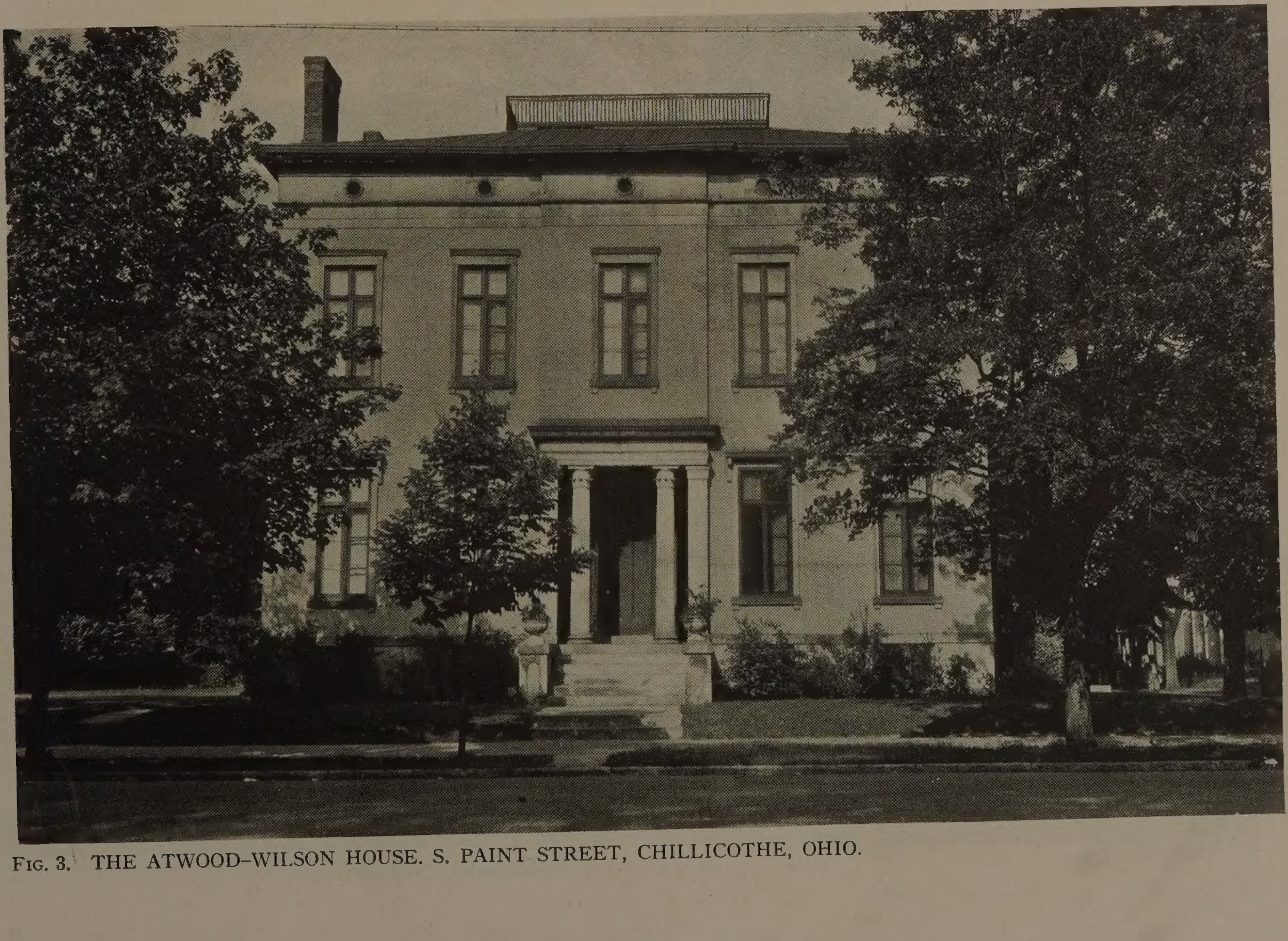


Fig. 3. THE ATWOOD–WILSON HOUSE. S. PAINT STREET, CHILLICOTHE, OHIO.

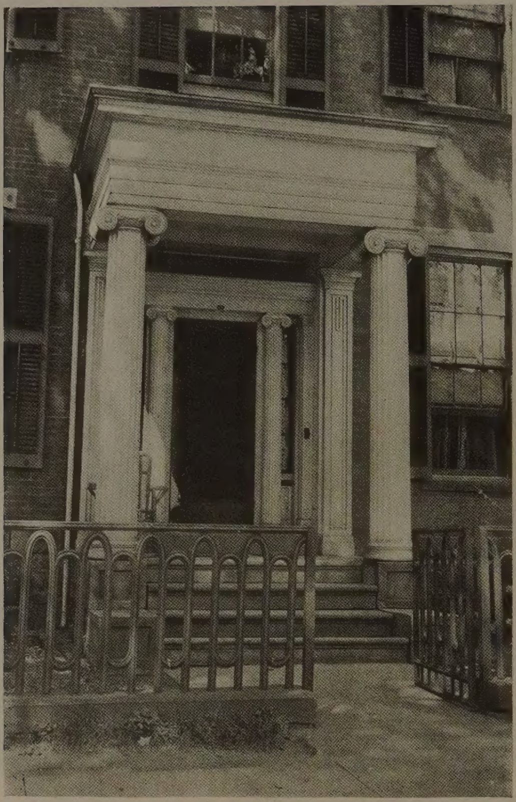


Fig. 5. Entrance porch and doorway, the McLandburgh-Fullerton house, Chillicothe, Ohio.

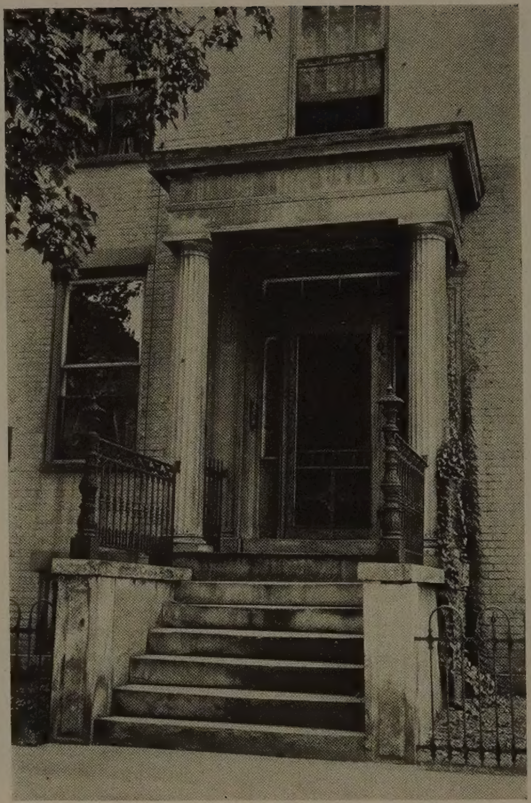


Fig. 6. Entrance porch and doorway, the Carlisle house, Chillicothe, Ohio.

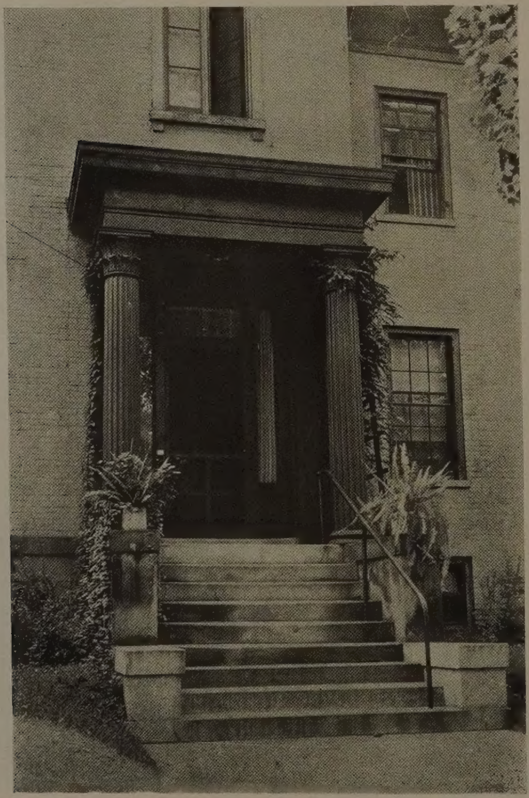


Fig. 7. The side entrance of the Atwood-Wilson house, Chillicothe, Ohio.

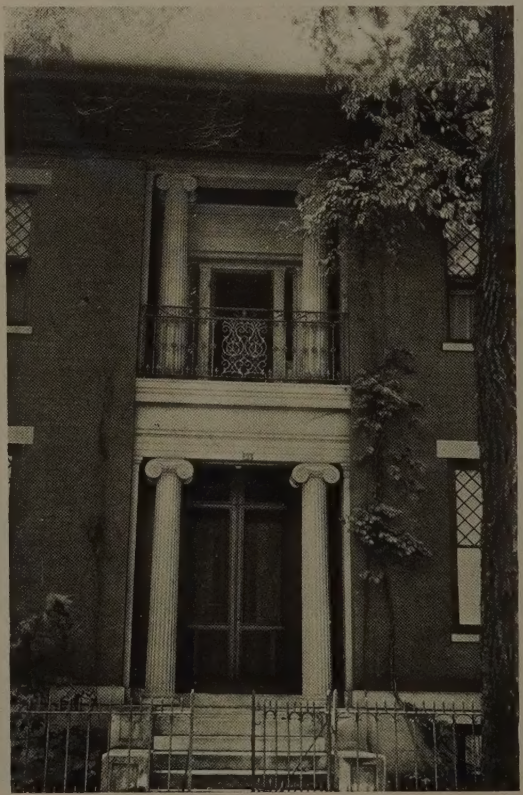


Fig. 8. Entrance and central motif of the King-Fullerton-Brown house, Chillicothe, Ohio.

to show the influence of the Greek revival. This was perhaps due to the fact that there was an abundance of good timber and that the sawmills and planing-mills were highly developed and manned by skilled woodworkers. It was easier and far more economical to work out architectural details in wood than to carve them in stone. There is evidence also of the use of carpenters' hand-books, for well-known hand-book motives are found repeated in many places throughout the town. The working out of details and proportions of the Greek orders and other architectural elements of the entrance porches and doorways shows a careful following of the book details. Due to the fine quality of the wood used, and the excellent craftsmanship of the time, there is much of this fine old woodwork remaining, as shown in the accompanying illustrations.

Paint Street, Chillicothe, is the counterpart of Chestnut Street in Salem. Along this old shaded thoroughfare are to be found many of the finest houses of the Greek revival in the city. But not all of the best work is confined to this one street; Main, Second, Fourth, and Fifth Streets have many fine examples still remaining. Chillicothe has not developed into a large, rapidly growing commercial centre, consequently many of these fine examples of early American architecture are preserved for us.

Most of the Greek revival houses of Chillicothe of this period are of the large, square, two-storied type, usually of brick with wood trim. As in the noted eastern city, the doorways and entrance porches are the outstanding features of most of them, and it is in these that the Greek motifs are most insistent. All three Greek orders are found: the Doric. Ionic, and Corinthian. In some rare cases the orders are omitted entirely, but the design is unmistakably in the proportions and spirit of Greek work.

The Reeves-Woodrow-Fullerton house (Fig. 1) is a typical plain, square, two-storied brick structure of the period of 1847. The Greek Ionic porch is the chief feature, and it is further enhanced by the imposing flight of stone steps and fine old wrought-iron step railing. Aside from its architectural merits, this particular house is of historic interest, for it was for a number of years owned and occupied by Thomas Woodrow, an uncle of the late Woodrow Wilson, and it is known that the latter when a young man visited here on several occasions. The original owner and builder of the house was Judge Owen Thornton Reeves, and it is said to have been designed by a Baltimore architect. It stands on South Paint Street. Just south of this is the McLandburgh-Fullerton house (Fig. 2), which dates from 1846. This is said to have been designed by the same Baltimore architect, whose name is unknown. Since 1865 it has been owned and occupied by Mr. A. L. Fullerton, who is also the present owner of the Reeves-Woodrow house. The Fullerton home is also of the large, square, two-story brick type, but is without the high basement which is a characteristic of the former house. The face brick are of very fine quality and color, and are said to have been shipped from Baltimore and were packed between blankets to protect the edges. In this example also the Greek Ionic porch and the doorway are the chief ornamental features of the house.

One block farther south on the same street is the Atwood-Wilson house (Fig. 3). It was built by the original owner, Jacob S. Atwood, in 1845, who seems to have been a prominent builder in Chillicothe in the forties. It was probably designed by a Mr. Kelly, an architect of Columbus, Ohio, who is known to have been the architect of a number of the better structures of Chillicothe. This house is also of brick, but differs from the usual type in that all the exterior trim—the cornice, the columns, and entrance features—is of stone. The Greek Corinthian order used is that from the Tower of the Winds, Athens. Near by is the Bartlet-Ritchart-Cunningham house (Fig. 4). This is of the one-story temple type, of brick, with wood columns, pediment, and cornice. Here also the order is that of the Tower of the

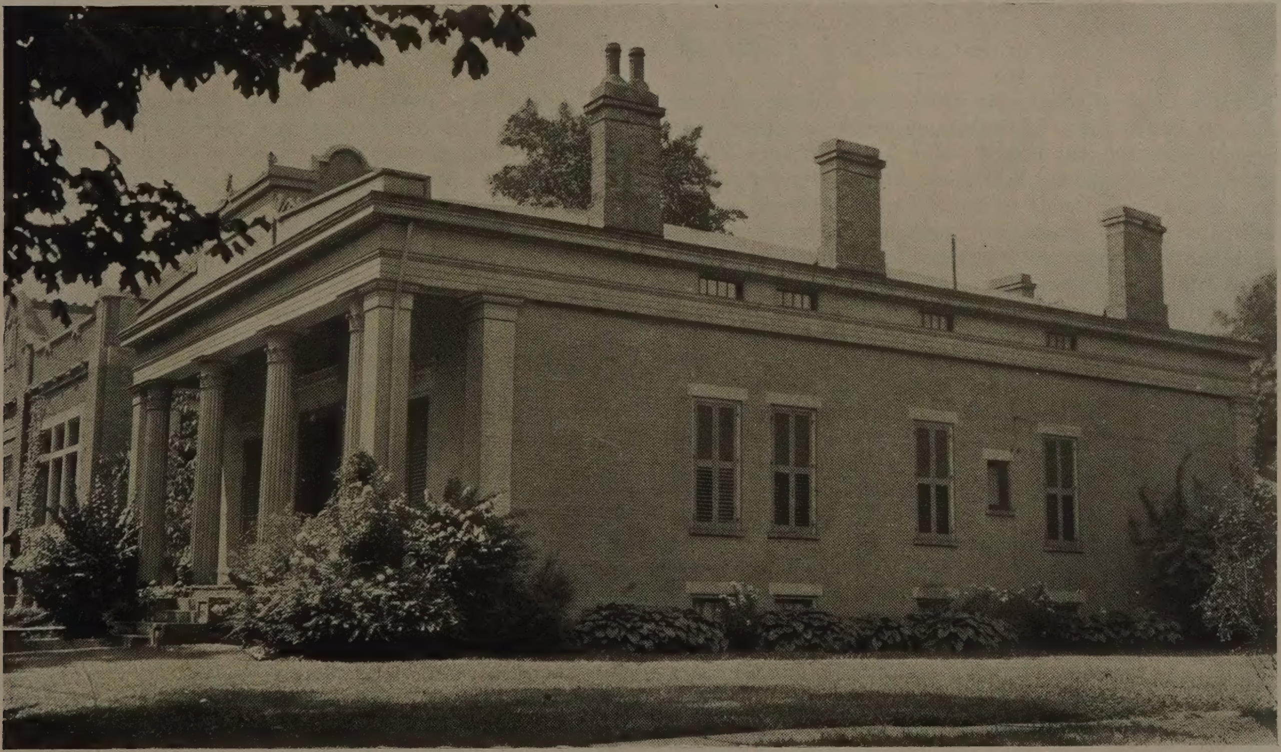


FIG. 4. THE BARTLET-RITCHART-CUNNINGHAM HOUSE, CHILLICOTHE, OHIO.

Winds, and is archæologically correct, because the column is used without a base. This house, also accredited to the architect Kelly, was built in 1850.

The finest architectural features of most of these old Greek revival houses are the doorways, which usually exhibit pure Greek forms. These entrances can be classified into two general types: those with the doorway protected by a small porch, supported usually by two columns, and those where the doorway is sheltered by recessing.

The entrance porch and doorway of the McLandburgh-Fullerton house (Fig. 5) is a good example of the first type. In this the Greek Ionic order is used both on the porch and as a part of the doorway, the whole treatment being very ornamental.

The porch and doorway of the Carlisle house (Fig. 6), located on East Main Street, is of the same type, but much simpler in design. In this case a modified Greek Doric order is used, but the treatment of the doorway is very plain. This house dates from 1840.

The side entrance of the Atwood-Wilson house (Fig. 7) is the third example of the porch type, and shows the use of the Greek Corinthian order, of the Tower of the Winds. The main entrance to this same house (Fig. 3) is of the second, or recessed, type; two columns placed in antis form the entrance to an exterior vestibule. The columns in this house are of stone, and are well executed.

The entrance doorways of the recessed type are of two varieties, the one-story and the two-story. The one just described is of the former type. A typical example of the two-story variety is that of the King-Fullerton-Brown house (Fig. 8), also located on East Main Street. This was built in 1837 by Edward King, a carpenter-architect, and is typical of the period when there was an attempt made to make this central portion of the front façade a dominant feature, and in the grandiose manner of the Greek revival. This consisted of a two-story recessed feature, with the main entrance below and a balcony above opening off from the second-floor hall. In this example the Grecian Ionic order has been used in superposition.

The Morris-Renwick house doorway (Fig. 9), on West Second Street, is typical of the modest yet dignified entrance of the period of 1840. The slight recess in the brick wall is filled with a simple wooden architrave, supported by two wooden columns of the severe Greek Doric type.

In the last illustration (Fig. 10) is shown the recessed doorway of the Watt-Safford house, on West Second Street. In this example the Greek character is only suggested, for the forms used are not Greek, but the simple lines and the proportions are in the spirit of Greek work. One of the chief criticisms brought against the builders of the revival period is that they were mere copyists of Greek forms. This example would indicate that this was not always true. In many cases these early builders and craftsmen were able to write into their buildings something of Greek refinement and spirit without the actual use of Greek forms.

When we consider these simple, refined, and dignified houses which have stood and served their purpose for over three quarters of a century and still retain their charm and usefulness, and contrast them with our many exotic creations inspired by Italian Renaissance villas, Spanish palaces, French châteaux, or English rural types, it becomes evident that we might, more appropriately, gain inspiration from these charming old houses of our early national period.

Efflorescence on Brickwork: Its Causes and Cure

By A. Redfern-Cornwell, A. R. I. B. A.

THE coating of white salts which frequently appears on the surface of brickwork, and which is called efflorescence, detracts considerably from the appearance of the brickwork, while the crystallization of the salts within the pores of the bricks tends to cause disintegration by action similar to that of frost. Furthermore, efflorescence may cause damp places on the brickwork so affected, destroying plaster and paint applied after the process has commenced.

I will first deal with the remedy in the case where the cause of efflorescence is due to the brick itself and its ingredients. In cases where efflorescence manifests itself in spite of all reasonable precautions, the first thing to do is to stop any means of water leakage into the brickwork, and, if the trouble is caused by the penetration of rain from the outside, the brick surface can be treated by the application of alternate washes of soap and alum solutions: the former in the proportion of 2.2 pounds of hard soap per gallon of water, and the latter in the proportion of 1 pound of alum per gallon of water. It is more economical and efficacious to employ aluminium sulphate ($Al_2 3SO_4$) in the alum wash instead of common alum or potassium aluminium sulphate ($K_2Al_2 4SO_4$). Where surface deposits are due to calcium sulphate, and therefore not washed off by the rain, they can be removed by scrubbing the face of the brick with hydrochloric acid diluted with about five times its volume of water. Care should be taken that before the acid is applied the brick surface should be thoroughly moistened and all traces of acid removed, after treatment, by washing the surface with water.

In the case of where brick clays are the cause through their containing magnesia, which is converted into sulphates in the process of being burnt, add one ounce of barium carbonate to every hundredweight of clay, thoroughly well mixed. The action is prevented, barium sulphate being formed, which is non-hygroscopic. Experiments should decide the exact amount to add by testing the results, as the proportion is governed by the percentage of salts contained in the clay, although the weights given will doubtless be found sufficient.

In the case of where the mortar is the cause of the efflorescence, it should be treated by mixing the mortar with some animal fatty matter in the proportion of 8 pounds or 12 pounds to 100 pounds of quicklime and 300 pounds cement powder.

To remove the efflorescence which has already made its appearance, the surface should be well brushed over in dry weather with a stiff broom, and the brushing repeated as it reappears until all salts have been removed.

There are cases where efflorescence is due to the extreme porosity of the brick, which readily absorbs moisture containing salts of magnesia of sodium. Oftentimes in new brickwork it makes its appearance, including the leaching out of certain lime compounds upon the surface. The remedy for the work already completed, provided the damp course is sound—is time alone.

As to the causes: Efflorescence is largely due to a large percentage of salts, which, during the burning of the clay, have been converted into sulphates. The effect of efflorescence is produced by what is termed saltpetring, and is first evident in new buildings, or even in older walls exposed to much damp.

The deposit is generally white, but is sometimes green or yellow, according to the composition of the clay used in brick manufacture. It is a sugar-like deposit of soluble salts carried by the moisture or water from the interior to the exterior of the bricks, and in time made manifest by crystallization or evaporation of the water or moisture.

Analysis shows that the composition of the crystals varies according to conditions.

These crystals consist of sulphates such as sodium sulphate (N_2SL_4), potassium sulphate (K_2SO_4), magnesium sulphate ($MgSO_4$), and calcium sulphate ($CaSO_4$).

In bricks made from clay found near the sea, chlorides are sometimes present, as potassium chloride (KCl) and sodium chloride ($NaCl$); while other clays furnish compounds, such as potassium carbonate (K_2CO_3), sodium carbonate (Na_2CO_3), sodium nitrate ($NaNO_3$), ferrous sulphate ($FeSO_4$), and aluminium sulphate ($Al_2 3SO_4$).

With the one exception of calcium sulphate, all the salts given above are soluble in water, most of them exceedingly so, as may be seen by the following table:

SALT	SOLUBILITY IN COLD WATER
Potassium sulphate	1 in 12
Potassium chloride	1 in 3
Potassium carbonate	1 in 1
Sodium sulphate	1.18 in 1
Sodium chloride	1 in 3
Sodium carbonate	1 in 2
Sodium nitrate	1 in 1
Calcium sulphate	1 in 500
Magnesium sulphate	1 in 3
Ferrous sulphate	1 in 2
Aluminium sulphate	1 in 2

Calcium sulphate, regardless of its relative insolubility, is the most fruitful cause of efflorescence, which is far less readily washed off by rain than that resulting from the more soluble salts.

The chief causes for the existence of efflorescent substances in bricks are due to one or more of the following conditions:

1. Soluble salts contained in the clay used.
2. Soluble salts formed while the clay is in the kiln—by the oxidation of minerals in the clay, or by the action of sulphurous kiln gases in the clay.
3. The use of clay tempering water containing soluble salts.
4. The introduction of soluble salts into the bricks after burning, generally from the mortar employed.

An undesirable variety of surface clay is that containing iron pyrites, or ferric desulphide (FeS_2)—as also clay which has been covered with sea water, for all these will exhibit a higher percentage of earthy salts.

Even in cases where the clay is of approved quality, foreign substances of deleterious character are sometimes introduced which result in the formation of salts giving rise to efflorescence. One example of such treatment is the use of ashes with the object of preventing shrinkage, and another is the adoption of sulphurous coal for burning.

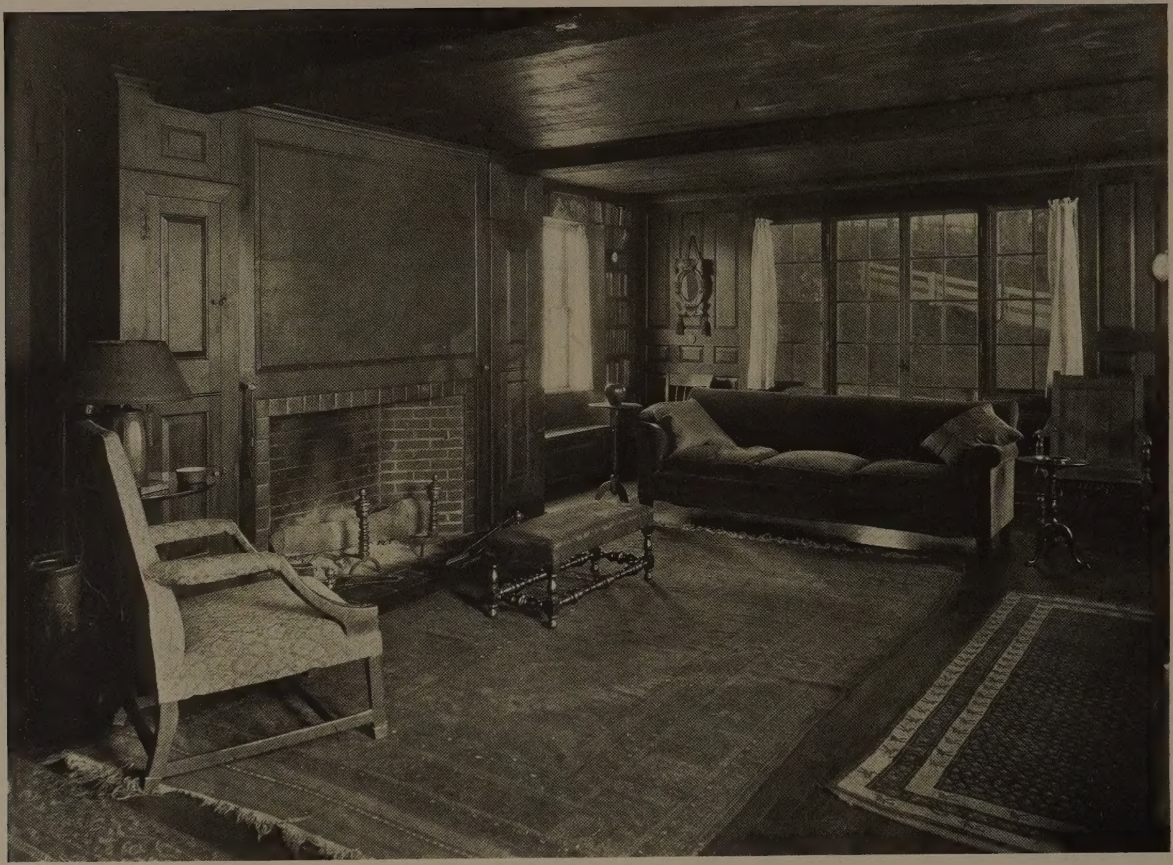
It occasionally happens that kiln-burnt bricks are impregnated with soluble salts, either in consequence of badly designed plant or inefficient management. Thus, after the dried bricks have been "crowded" into the kiln and the process of heating up has been commenced, if the fires are kept only just high enough to evaporate the moisture in proportion to the chimney draught, the process is unattended with prejudicial conditions.

But if the moisture is evaporated too rapidly for the capacity of the shaft, the surplus vapor in contact with the bricks may absorb sulphur from the gases, resulting in the formation of sulphuric acid, which by combination with the carbonates and other salts will give rise to soluble sulphates, the most general cause of efflorescence. Where certain ingredients of the clay are calculated to give unsatisfactory results, various methods are adopted. The risk of efflorescence can be overcome in clays capable of being vitrified, thereby converting the salts into permanent silicates.

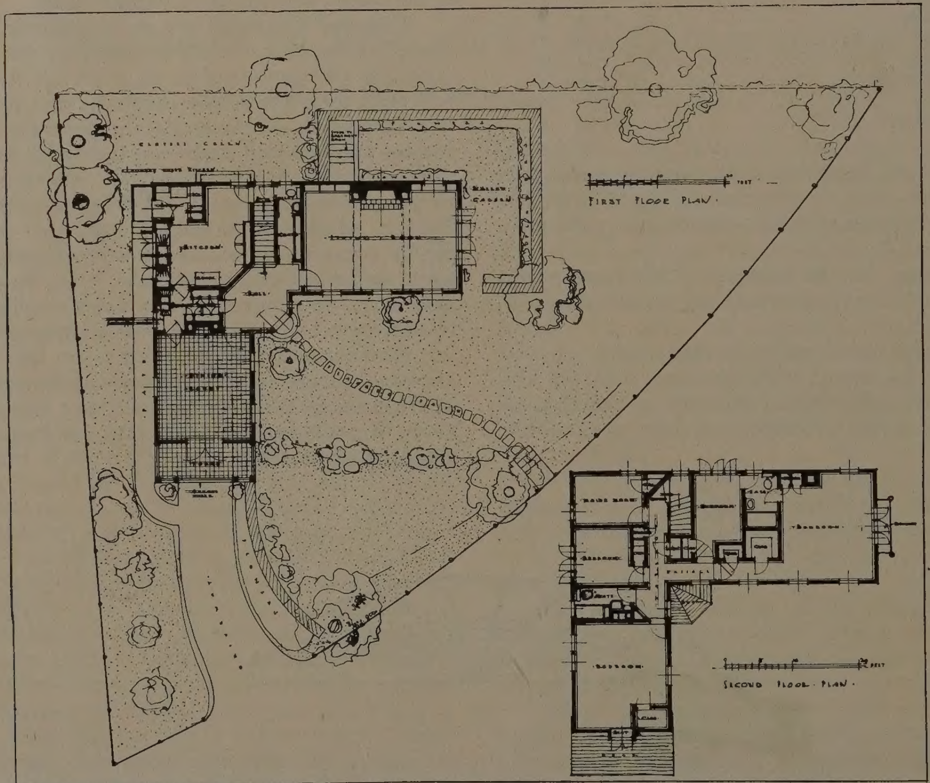
Clays containing earthy salts can be rendered harmless by washing, but in the case of low-priced bricks this method is too costly, and therefore impracticable.

Chemical treatment is a more scientific expedient, performed in the case of clays prepared by the wet process by adding to the water used in the wash mill such chemicals as will react upon the soluble sulphates and precipitate harmless compounds, the chemicals most generally employed being barium chloride and carbonate, resulting in the precipitation of barium sulphate ($BaSO_4$), which is only soluble to the extent of one part in 400,000 parts of water by weight. Even if soluble sodium salts are present, they would simply be converted into carbonate or chloride by the corresponding barium compounds, and, being very soluble, these salts would be removed by rain quite readily if brought out by efflorescence on the surface of brickwork.

Examination and purification of the water used in brick-making are quite as necessary as treatment of the clay. The operation, being simple and very inexpensive, should never be neglected, as good clays are frequently contaminated by saline water.

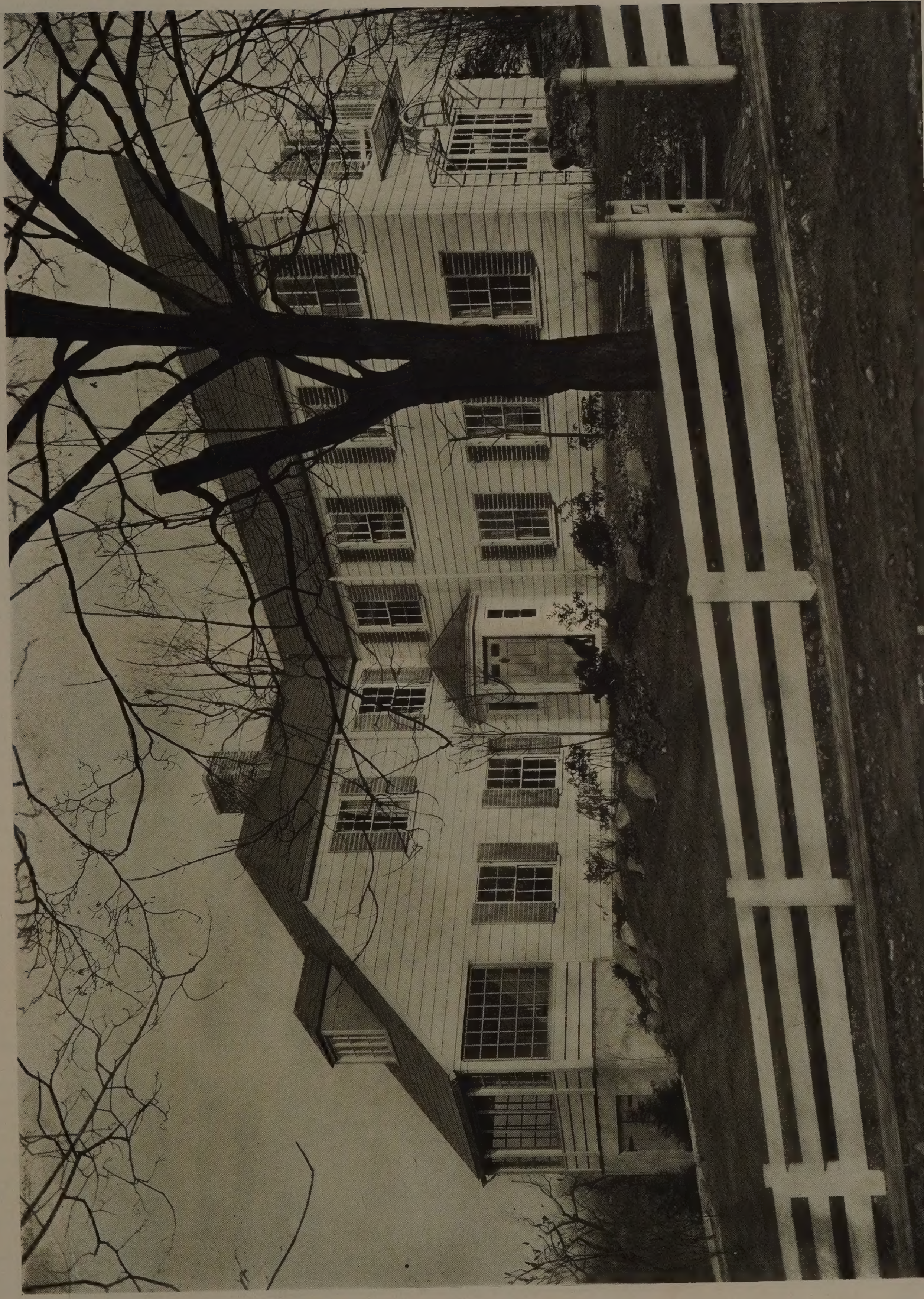


LIVING-ROOM.



FLOOR PLANS. Strickland, Blodget & Law, Architects.

HOUSE, MRS. ALEXANDER F. LAW, BROOKLINE, MASS.



HOUSE, MRS. ALEXANDER F. LAW, BROOKLINE, MASS.

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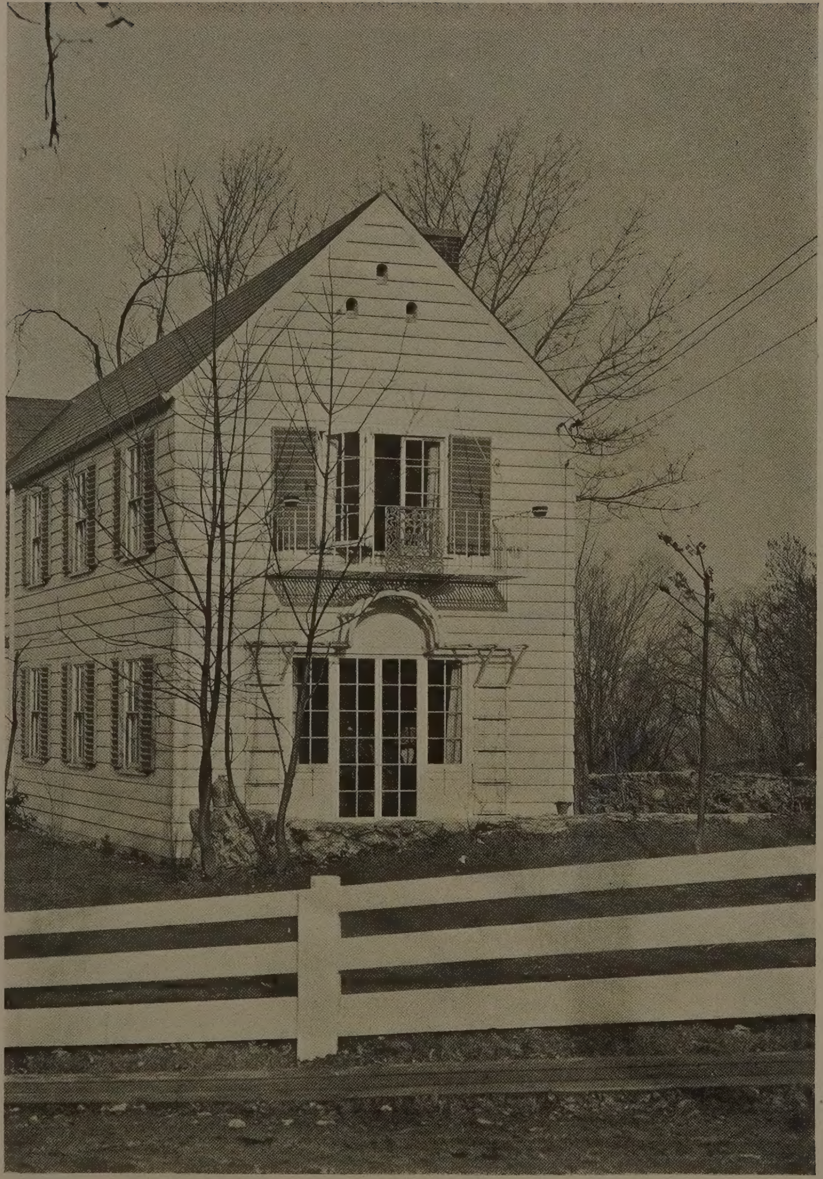
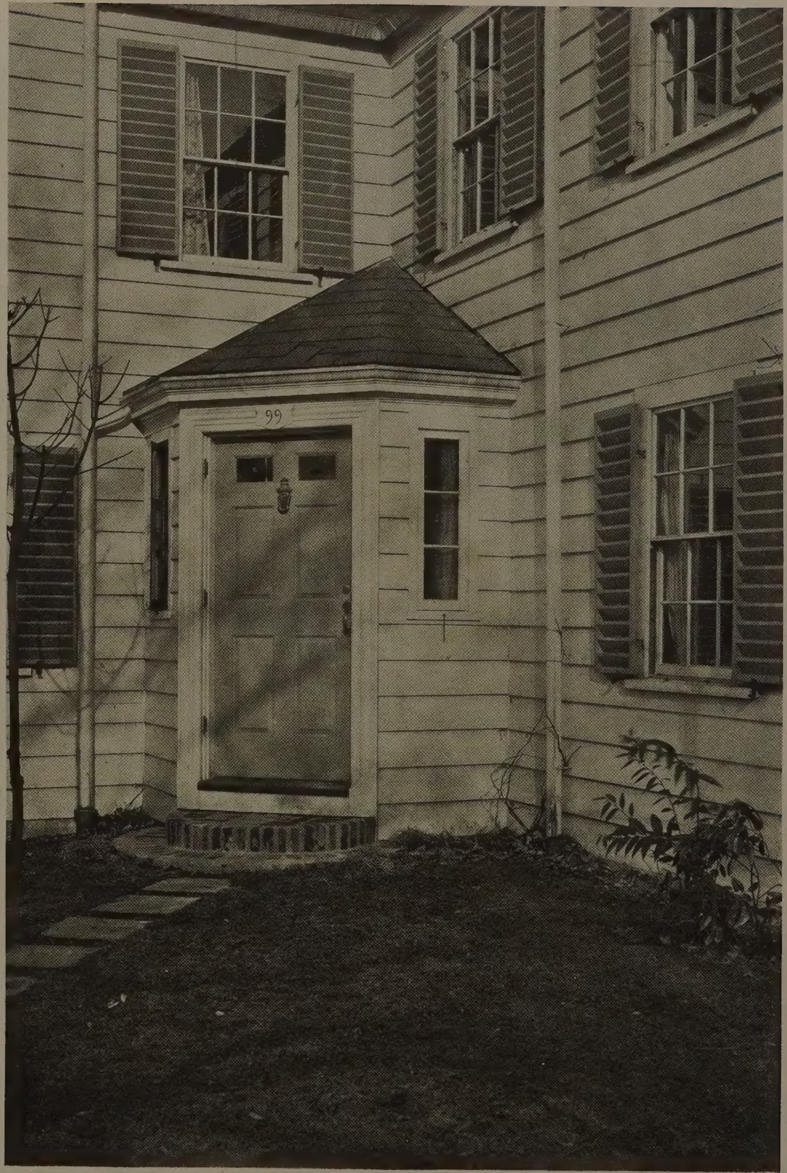


LIVING-ROOM WING.



ENTRANCE PORCH.

Strickland, Blodget & Law, Architects.

HOUSE, MRS. ALEXANDER F. LAW, BROOKLINE, MASS.

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Editorial and Other Comment

Our Architectural Schools

IN the old days it used to be thought quite necessary for the young man who wanted to be an artist or an architect—we mean to imply no invidious comparisons—to go to Paris and spend several years absorbing atmosphere and such things, in the Latin Quarter. So far as the painter is concerned, it is an exploded theory. A young man with talent and purpose can acquire a perfectly competent art schooling at home, save money, and, in many instances, save his self-respect, that is best conserved by an environment that demands a certain Anglo-Saxon regard for the conventions. Too many youngsters go to Paris to have fun. They substitute "atmosphere" for hard work, and are apt to come home disillusioned and in a mood to look down upon about everything that stands for wholesome and traditional art. We recall the attitude of one of our brilliant young illustrators who went over for a few years. His return was signalized by a contemptuous attitude toward all American art, and it took him several years to come down to earth and admit that the best thing he learned over there was to realize the opportunity offered to find his real inspiration in his own country. He has found it and has made a distinguished place for himself, not to speak of very satisfactory financial returns. The young architectural student has before him schools of the highest quality and equipment. They are to be found all over the country. Mr. George C. Nimmons, in his report of the Committee on Education of the American Institute of Architects, says:

"As to the education of the architect, I wish to say that the profession to-day is very fortunate in having the finest and best-equipped and most efficient schools of architecture that we have ever had in this country. I believe it would be of interest some time to tell the practising architects exactly how a young architect of to-day is educated and trained to practise his profession. I think most of you would be astonished to know and to see that we are preparing this country to educate an architect to practise in an art, in a manner even superior to that which is given at the Beaux Arts in Paris. That is, I mean to say that the education and training of an architect whose practice is in America is better adapted to his work than the education offered in Paris.

"The reason for that is that our schools not only teach design, which is the outstanding thing, of course, in a manner similar to the way they do over there, but we give, in addition to that, a vast amount of instruction and training in things which a student does not get in Paris. I mean we give a student here a general education and instruction and training in the things he needs in this country particularly, that he couldn't get there, and so the result is that most of our boys now go to our own schools of architecture.

"There are eighteen accredited schools. An accredited school means that the school of architecture has come up to a certain standard—a high standard of excellence—and is therefore approved and accredited by the association as a collegiate school of architecture, and that means that wherever a boy goes, and whatever part of the country he goes to, if he attends one of these eighteen schools he is assured of getting the finest and best education."

Now and then we are impressed by the fact that the best architectural school possible for some young men is to get into an established office and work up, doing any and every old thing that offers. Here and there the born architect is developed. It was so with Bertram Grosvenor Goodhue, as we may learn in the recently published book about the man and his work. He had little schooling in the ordinary ways, but he had genius that knew no obstacles, talent beyond the average measure, that grew apace with the opportunity to manifest it. There are many leaders in the profession to-day who will gladly admit that they owe their success to the inspiration and hard work that came from breaking into some famous office. An old story in art or literature, law, medicine, engineering; and our magnates of business may be counted by thousands who began on the basement stairs of some obscure shop, and climbed to the top of a modern skyscraper with "it is all mine" plainly written above the bronze doors.

"Maximum Sardine Capacity"

WE owe the heading to *Lutheran Church Art.* In that ably edited little publication there is an article on building costs that contains some salutary information for many optimistic congregations and designers of churches. Building churches, like everything else, has become a matter for counting the cost. The writer, to whom we are indebted for the information, says that "we believe that the cost of church building is at least 120 per cent higher to-day than it was ten years ago. The cost per seated person in a very simple brick church without tower or basement will be close to $140. A basement will add from one-fifth to one-fourth the cost of an average church. A tower means a similar cost.

"Printed reports of church dedications are often misleading. 'Our new church seats 700 persons, and cost $70,000,' read one report. We took the next train to that city, to see how it had been done. But when we pulled out our trusty six-foot rule, the 700 sittings suddenly shrunk to just half that number! Instead of costing $100 per person seated, that church really cost close to $200 per person seated. The whole trouble was that they counted their dedication-day crowd, when there were folding chairs in every aisle, in front, in the rear, in the gallery, and people wedged into every step of the two gallery stairways.

"Reports of church dedications are invariably optimistic. Maximum sardine capacity is counted, and the results done into print. This fact ought to be kept in mind, in estimating the cost of the church on the cost-per-person-seated basis. Congregations ought not to jump at the conclusion that they can build a church for $100 per person seated."

Average Building Costs per Square Foot

THE index of building costs compiled by the Federal Reserve Bank of New York indicates that the average expense of building this year has been slightly higher than a year ago, while the cost index of the *Engineering News-Record* reflects a decline of more than 5 per cent. The marked disparity between these two indexes is probably due to the varying importance assigned to the different materials entering into the averages. The index of the Federal Reserve Bank is based on the wholesale price index of building materials published by the Department of Labor, which gives great weight to the price of lumber, and very little to the price of structural steel. On the other hand, this index is considerably more inclusive than the other, which is based on prices of only a few of the most important materials. The two indexes ascribe about the same importance to the cost of labor—approximately 40 per cent of the total.

Some light is thrown on the question of comparative costs by a consideration of the area and value represented by contracts awarded. The average value per square foot of floor space during the first five months of this year, and the corresponding period last year, by classes of building, is as follows:

CLASSIFICATION	1925	1924
Commercial	$5.39	$5.17
Educational	6.51	5.77
Hospitals and Institutions	7.92	6.83
Industrial	6.91	6.78
Military and Naval	5.78	6.60
Public Buildings	7.65	6.85
Religious and Memorial	8.63	7.44
Residential	4.87	4.58
Social and Recreational	8.22	5.62
Average	$5.47	$5.06

It will be noted that the average cost per unit of area is materially higher this year in every group except military and naval buildings, which form only a very small proportion of the total. The average increase in unit cost is about 8 per cent. This rise does not by any means measure the advance in average building costs during the year; but it does provide some basis for the contention that an advance rather than a decline, for the country as a whole, has taken place.

The Penalty of Poor Design and Bad Construction

DOCTOR BAILEY WILLIS, professor emeritus of geology, Stanford University, and president of the Seismological Society of America, was among the first to make a survey of the damage at Santa Barbara.

His outstanding comment on the situation was that a dominant reason for much of the destruction was "poor design and bad construction."

Doctor Willis further said: "The responsibility really comes back to technical men and *public opinion*. If the engineers and architects had insisted on adequate building laws, embodied in a proper code of regulations, and if public opinion had supported the officials in a rigid enforcement of the rules of good construction, this moderately severe earthquake would have passed simply as an interesting experience."

The study of earthquakes is in its infancy; one thing definitely known about them is that you can never tell where they will shake next. Science has pretty well established the fact that in many ways our planet is still in the process of making. Changes constantly taking place in the interior necessitate compensating adjustments of the surface. Frequently these are violent, as people of Japan and sections of the Pacific Coast both in North and South America can well testify. In 1923 and 1924 alone earthquake shocks were felt in the United States in Oregon, January 6; Seattle, April 25; Walla Walla, Wash., January 27; Winchester, Va., January 1; Hendersonville and Saluda, N. C., October 18, 1923; Cairo, Ill., and Paducah, Ky., April 2, 1923; Memphis, Tenn., Springfield, Ill., Owensboro, Ky., in the latter part of 1923, and in many parts of Maine on September 30, 1924. They are so frequent on the Pacific Coast as to cause little comment when no damage results.

In the Santa Barbara earthquake many buildings were totally destroyed. All types of construction seem to have suffered varying degrees of damage. As was the case in Japan, buildings which expressed the most modern practice in engineering design and workmanship, thus resulting in structures that were practically a monolith, gave the best account of themselves. In Japan some such structures went through without the slightest injury. Structural engineers who made inspections took home lessons which pointed the way to prevent failure in the future, namely, proper design and competent workmanship.

There is no need to claim that we can build every time 100 per cent proof against the devastating forces of nature. Experience has proved, however, that we can defeat their attacks to the extent of a 75 per cent victory at least, which is a salvage and a protective value worth attaining.

It is also just as well to remember that if buildings can be built to withstand earthquake they will certainly withstand fire and tornado, two additional and altogether too frequent destructive elements.

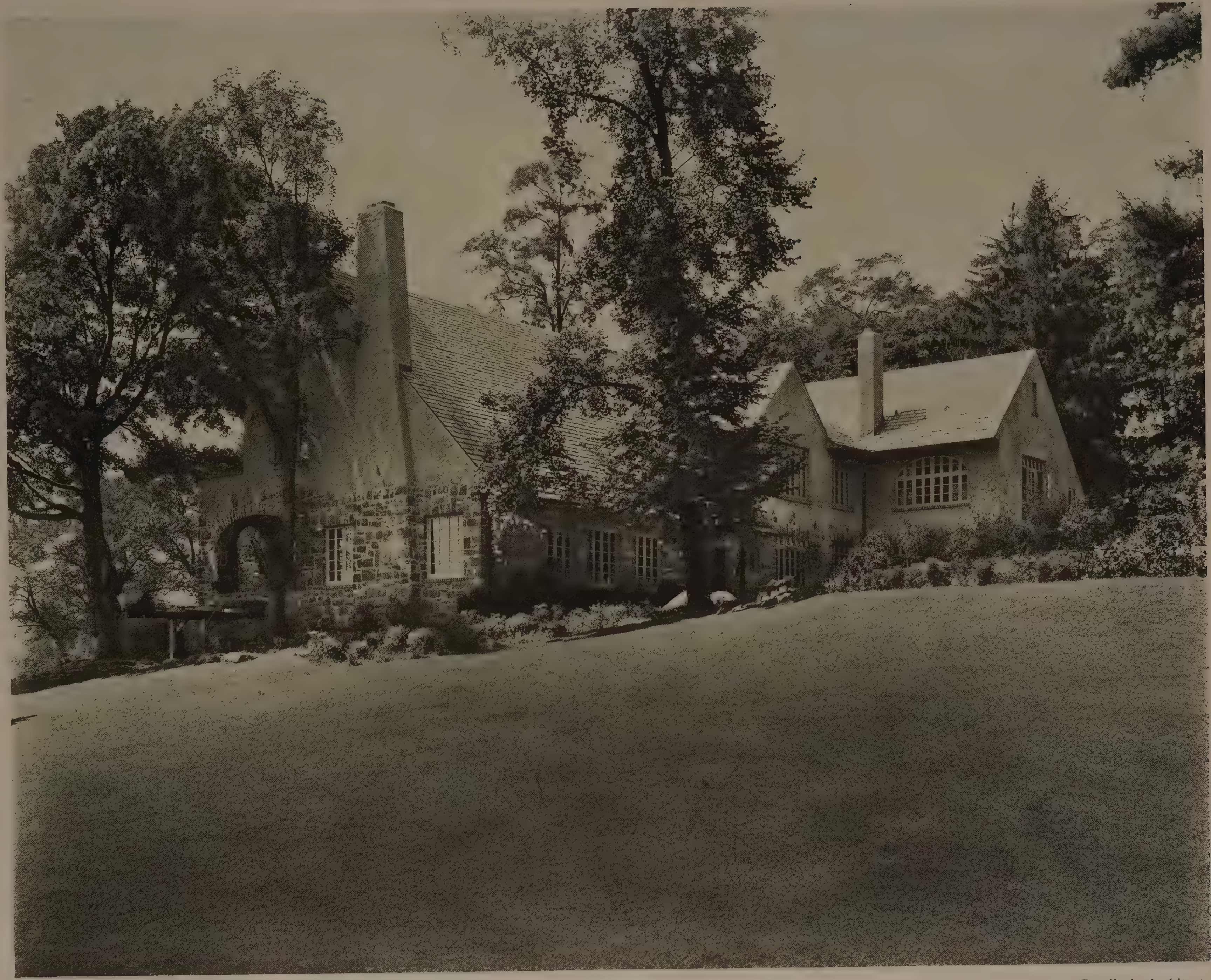
Production of Building Stone

PRODUCTION of stone in the United States in 1924, exclusive of stone manufactured into lime, cement, and abrasive materials, or crushed into sand, amounted to more than 102,366,000 short tons, valued at about $160,000,000, according to a preliminary compilation of reports from producers made by the Bureau of Mines, Department of Commerce. The figures indicate a reduction of about one per cent from the 1923 production figure of 103,327,460 short tons. The value of the 1924 production is practically the same as the 1923 figures, $159,947,241. Final figures for 1924 production may be somewhat greater than the preliminary figures.

Stone sold as building stone, curbing, flagstone, and crushed stone increased in quantity, and stone sold as monumental stone, paving blocks, flux, and refractories decreased. The total of stone sold for rubble, riprap, manufacturing industries, and miscellaneous uses is estimated as slightly less than in 1923.

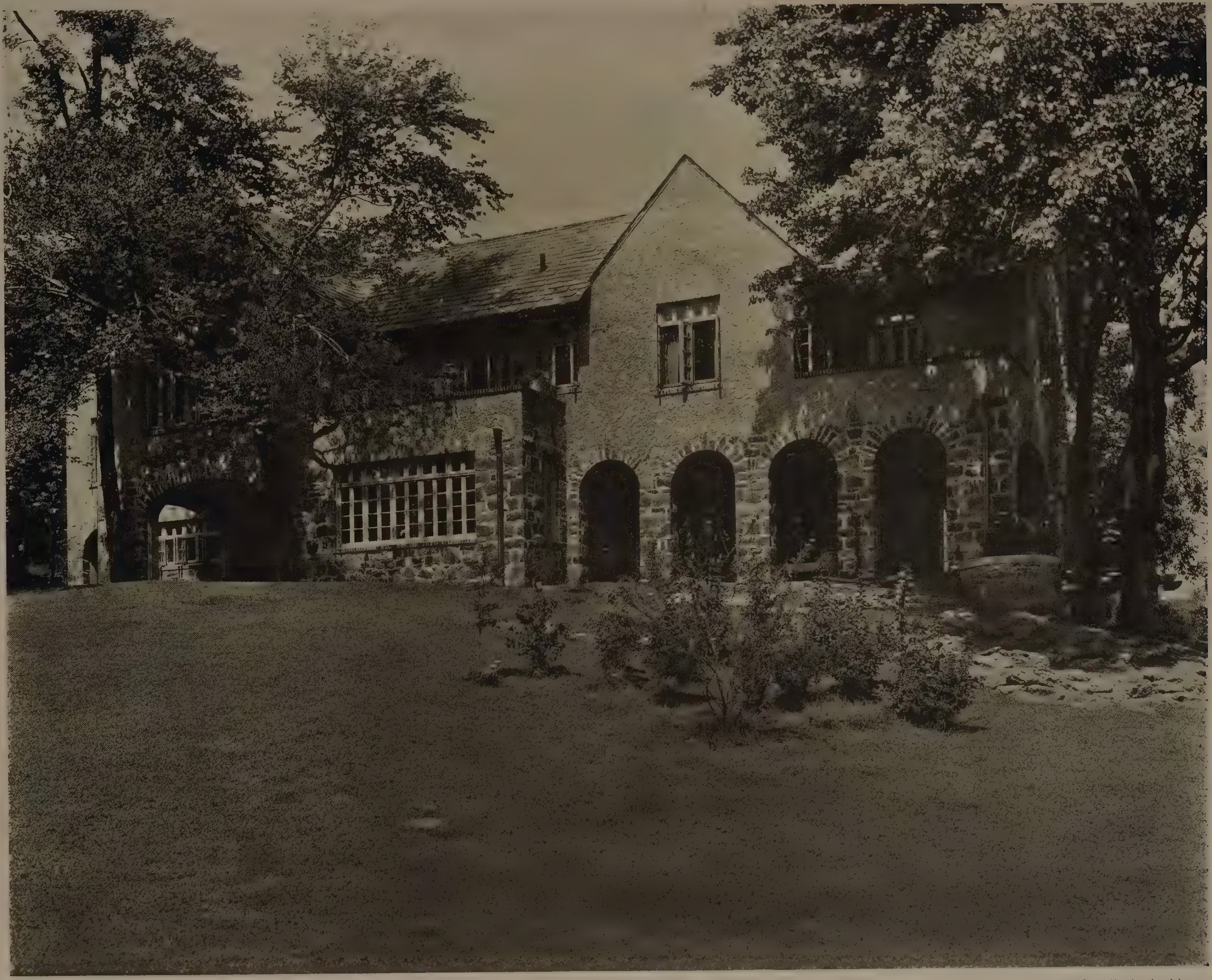
The United States to Have Their Own Embassy and Consulate Buildings in Japan

H. VAN BUREN MAGONIGLE and Antonin Rayond have been appointed architects for the new Embassy and Consulate buildings to be built in Tokio. Mr. Magonigle will sail in October for a preliminary survey of conditions. His great Kansas City Memorial is nearing completion.



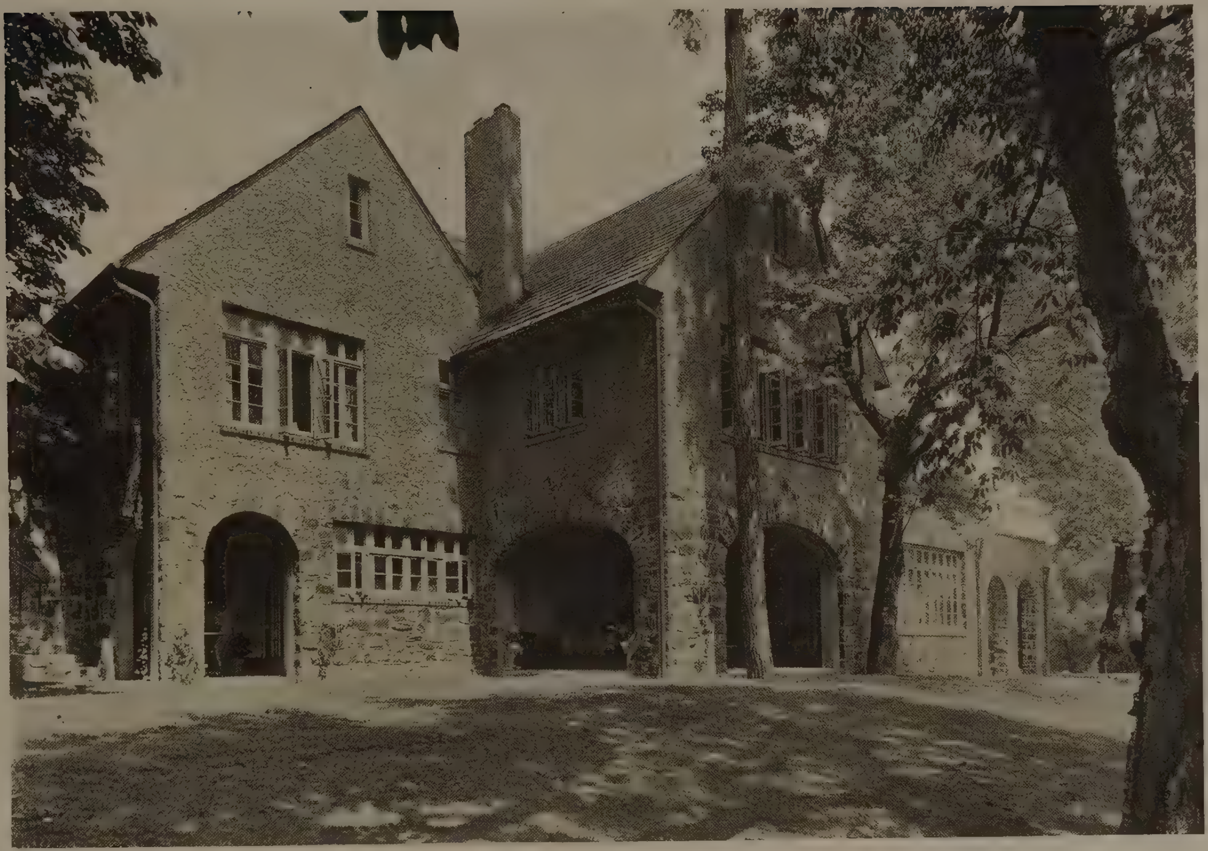
NORTH FAÇADE, RESIDENCE, J. M. HUBER, LOCUST, N. J.

Brutus Gundlach, Architect.

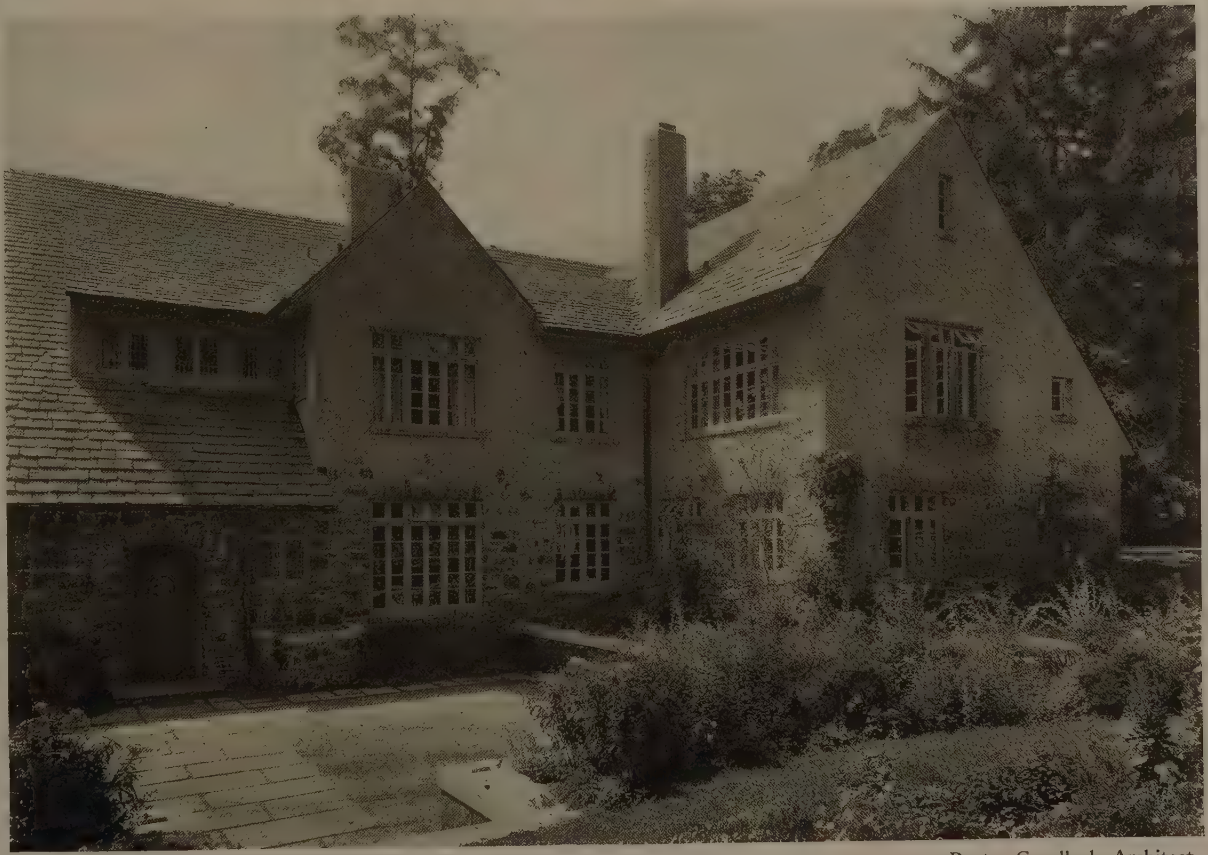


SOUTH FAÇADE, RESIDENCE, J. M. HUBER, LOCUST, N. J.

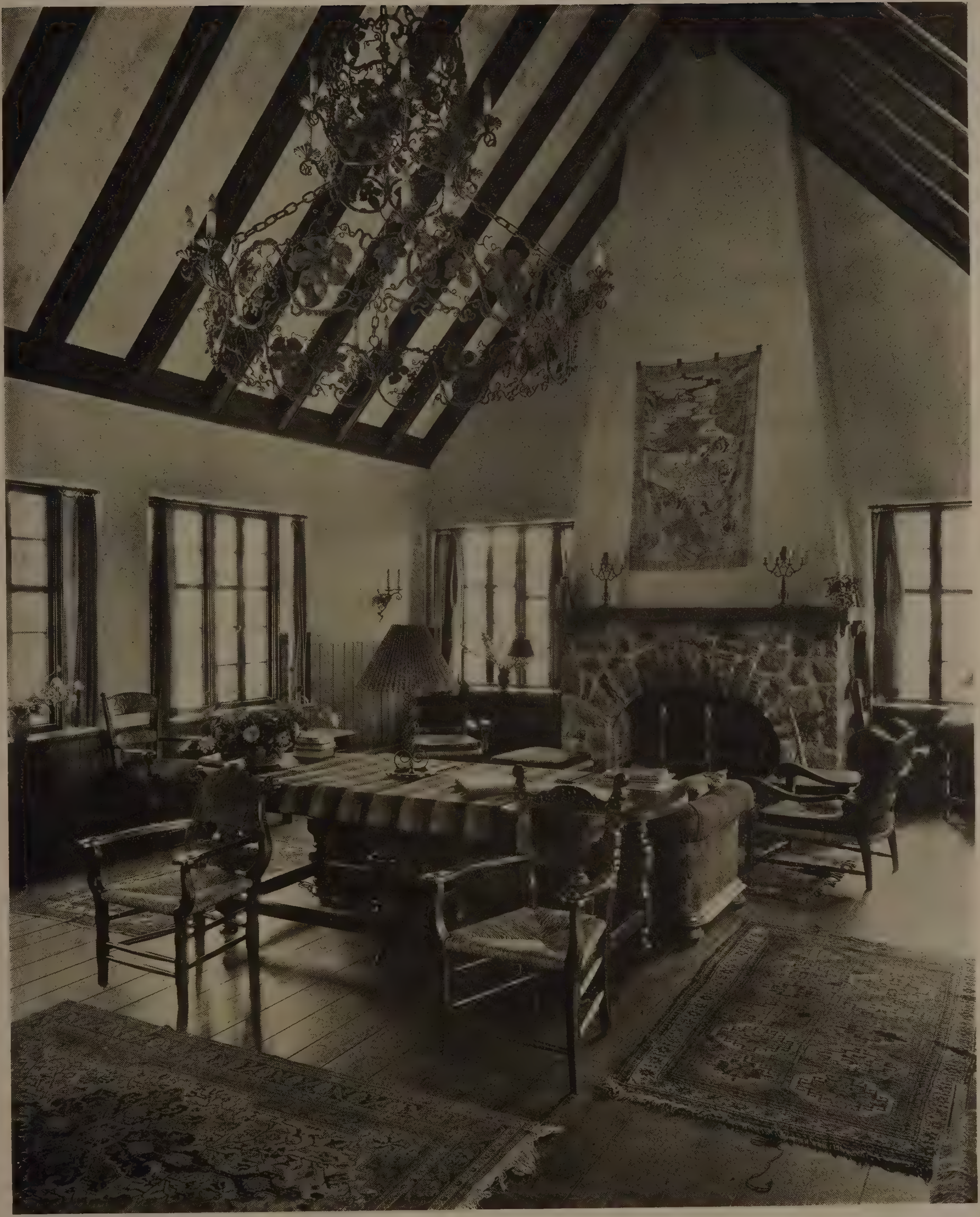
Brutus Gundlach, Architect.



SERVICE WING.

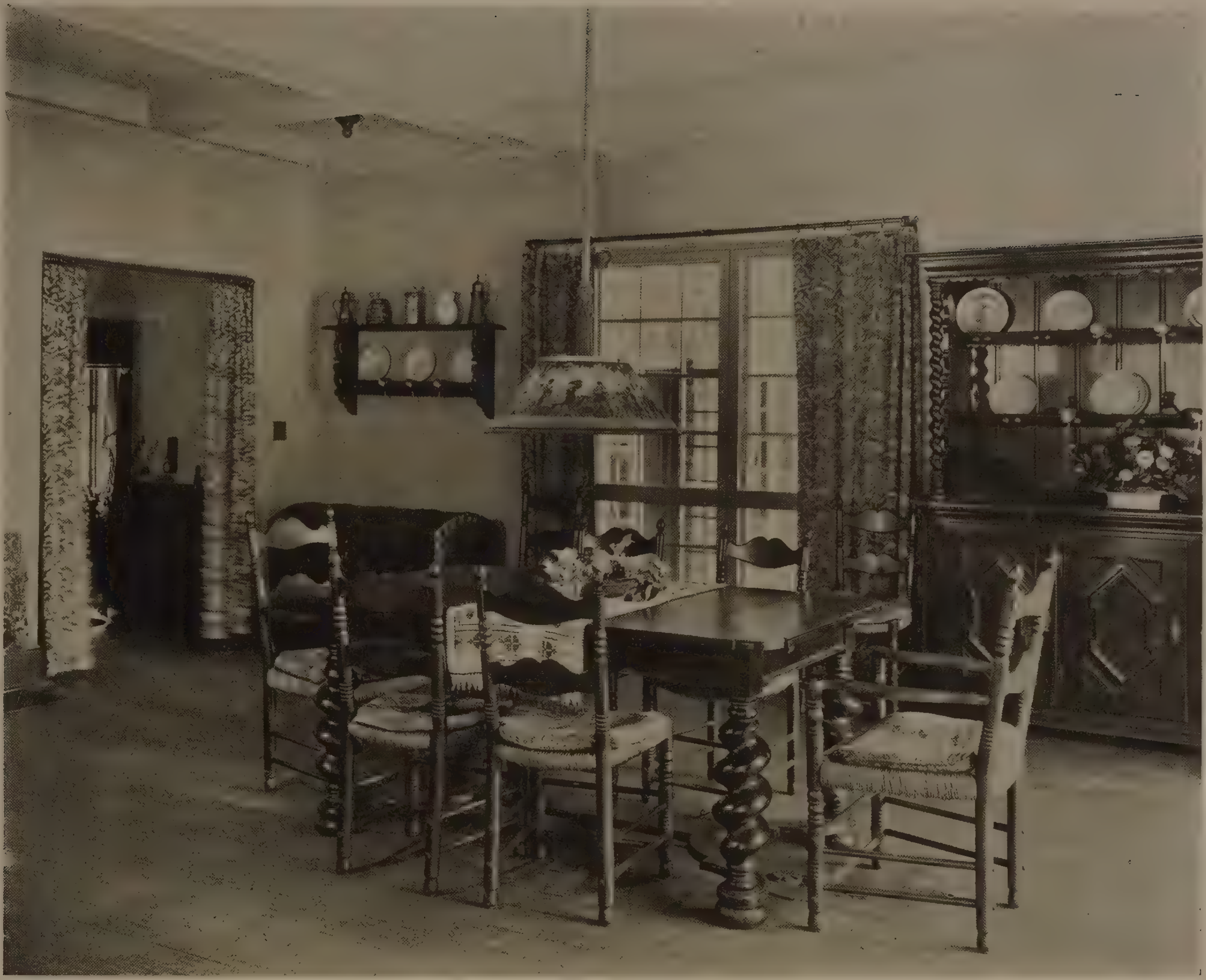


DETAIL, SERVICE WING, RESIDENCE, J. M. HUBER, LOCUST, N. J. Brutus Gundlach, Architect.

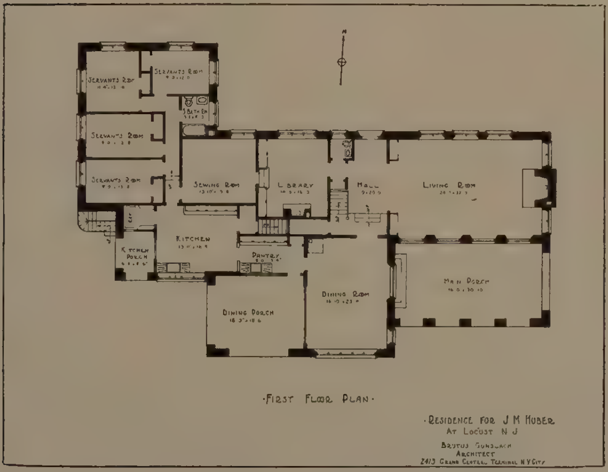


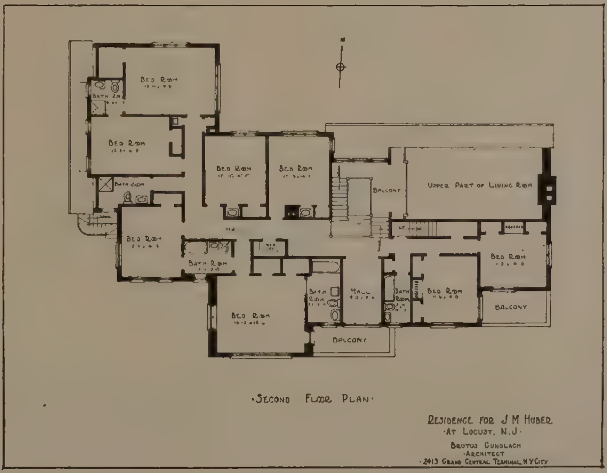
LIVING-ROOM, RESIDENCE, J. M. HUBER, LOCUST, N. J.

Brutus Gundlach, Architect.



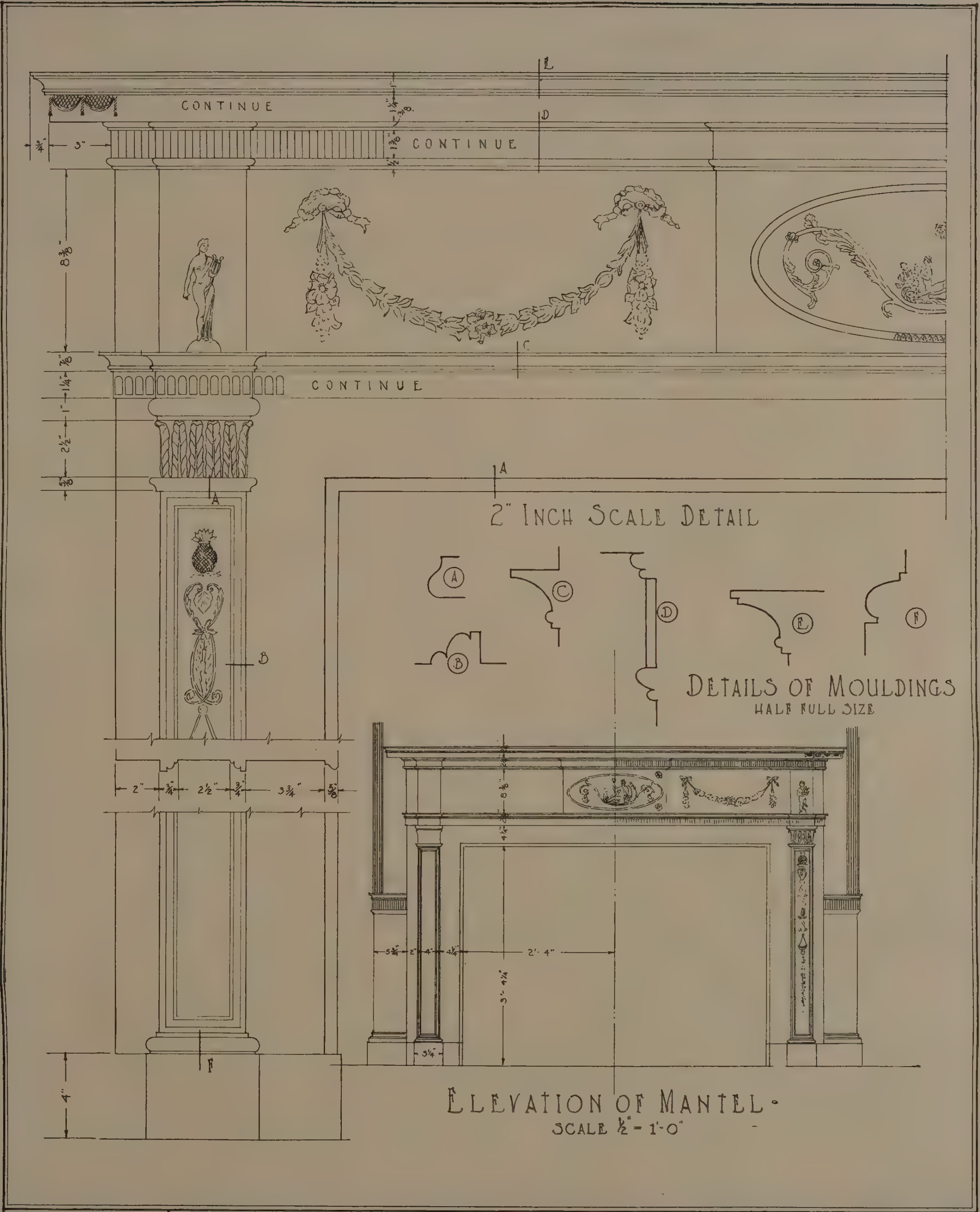
DINING-ROOM.





RESIDENCE, J. M. HUBER, LOCUST, N. J.

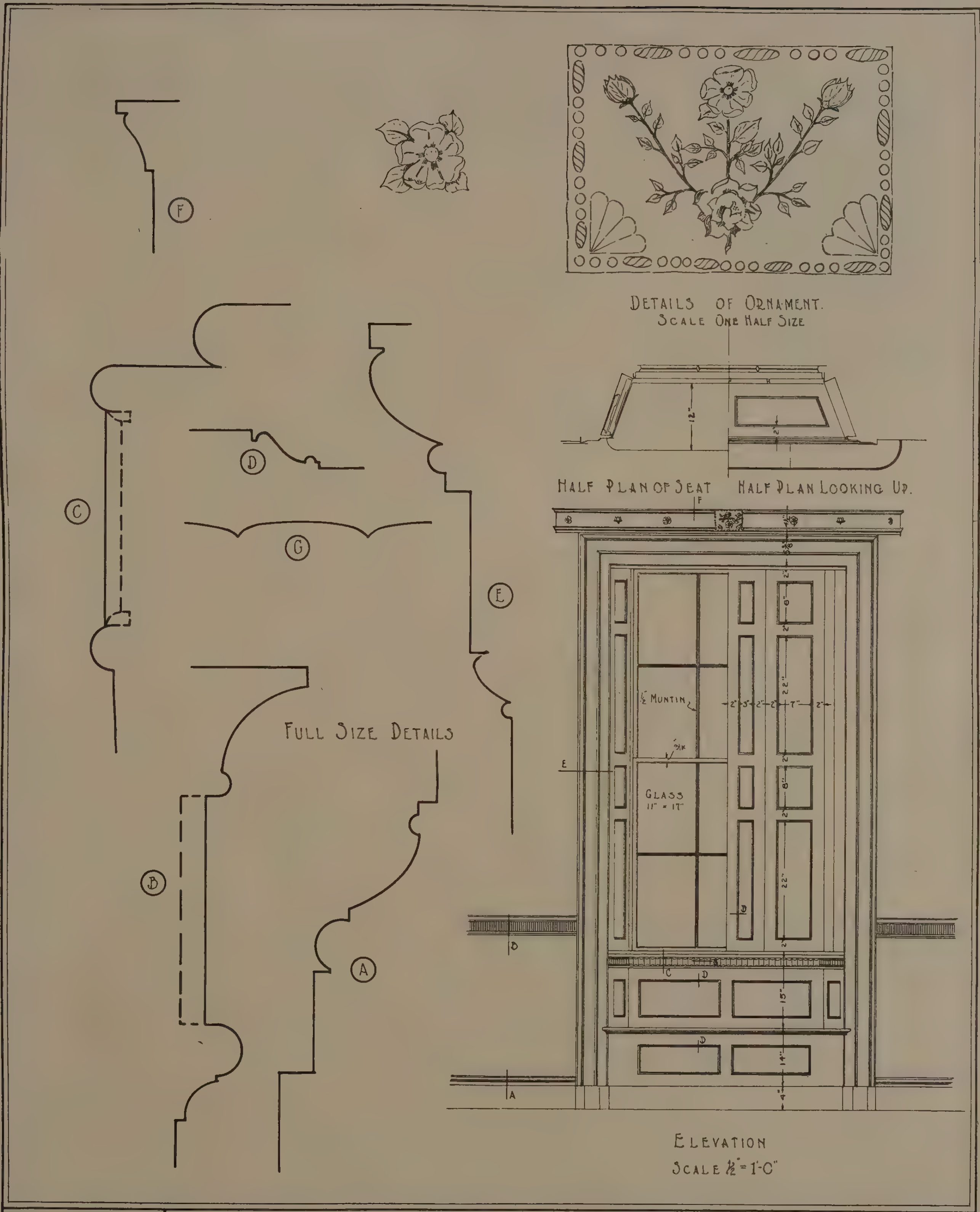
Brutus Gundlach, Architect.



MAINE
COLONIAL
SERIES

MANTEL of the GEN. Mc LELLAN HOVSE
TOPSHAM · BUILT IN 1793 MAINE

MEASURED AND
DRAWN BY
A. J. HARRIMAN.



MAINE
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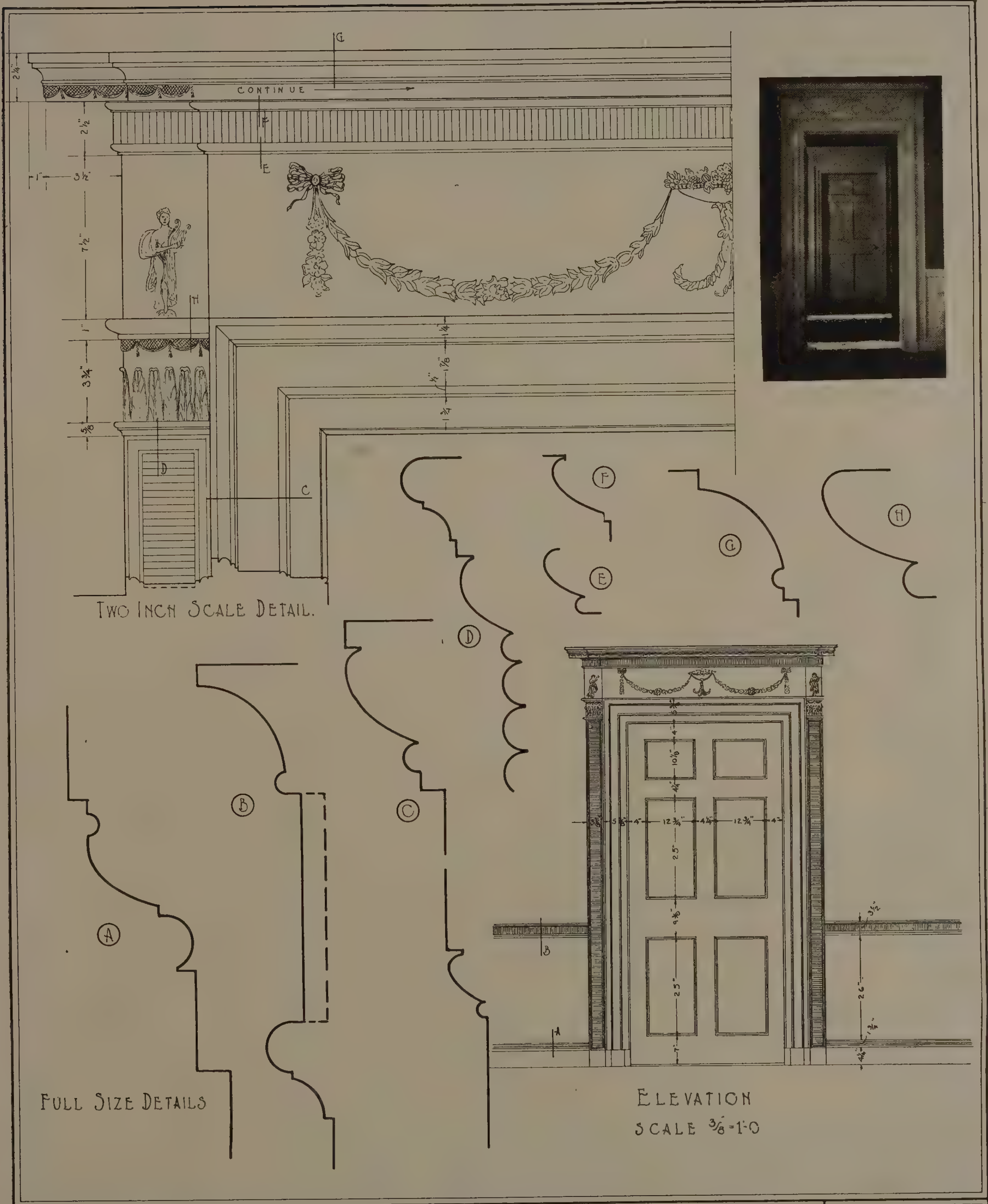
WINDOW of the GEN. Mc LELLAN HOUSE
TOPSHAM . BUILT IN 1793 MAINE

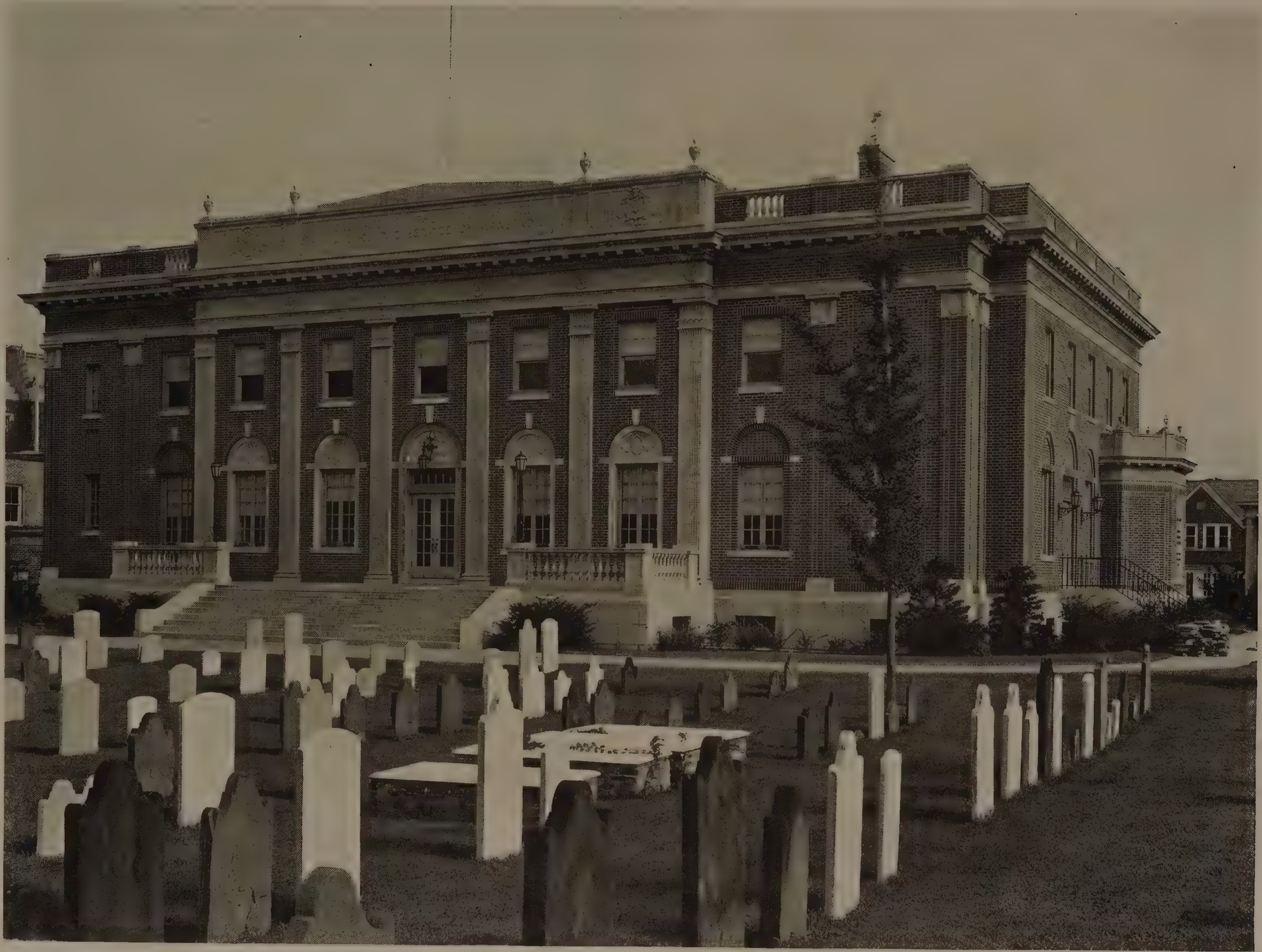
MEASURED AND
DRAWN BY
A. J. HARRIMAN.



MAINE
COLONIAL
SERIES

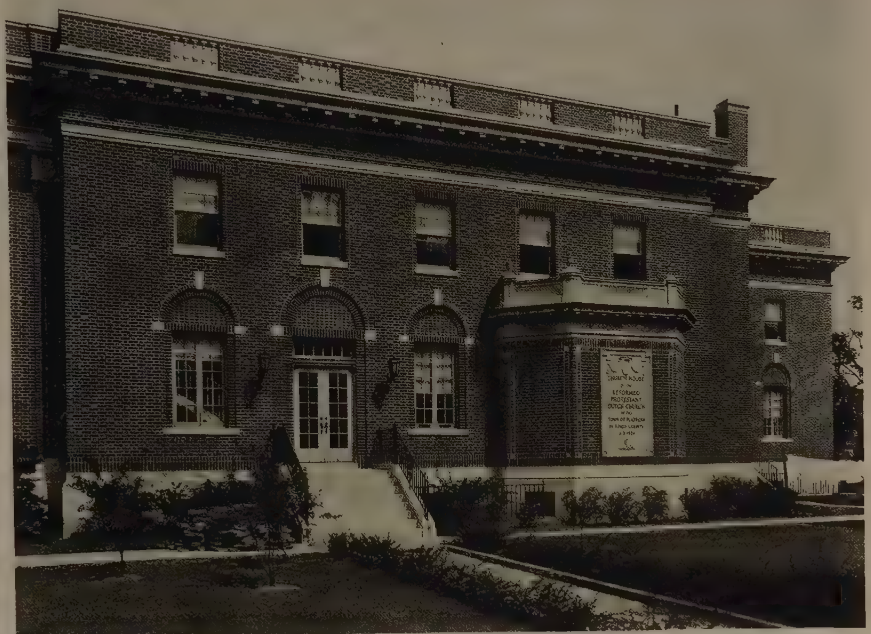
DOORWAY of the GEN. Mc LELLAN HOVSE
TOPSHAM · BUILT IN 1793 MAINE

MEASURED AND
DRAWN BY
A·J·HARRIMAN·

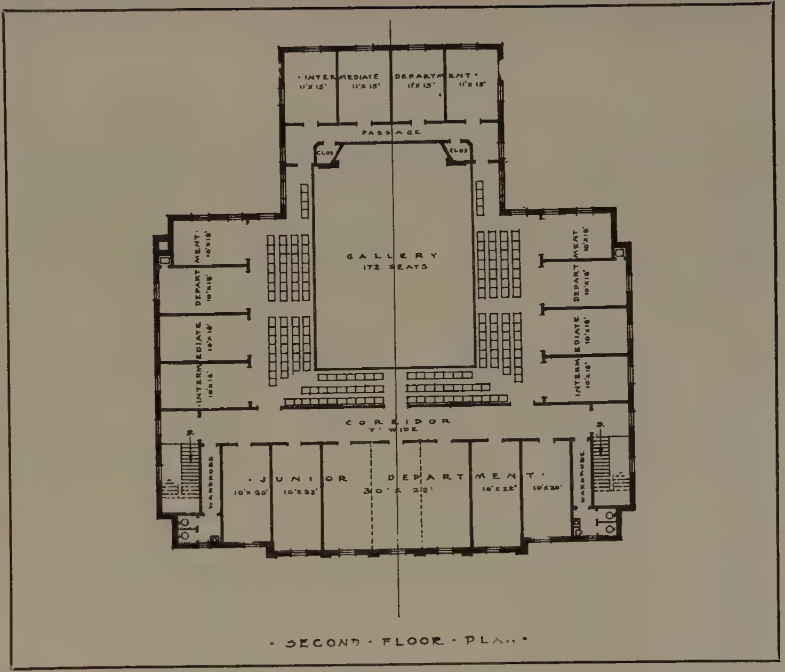


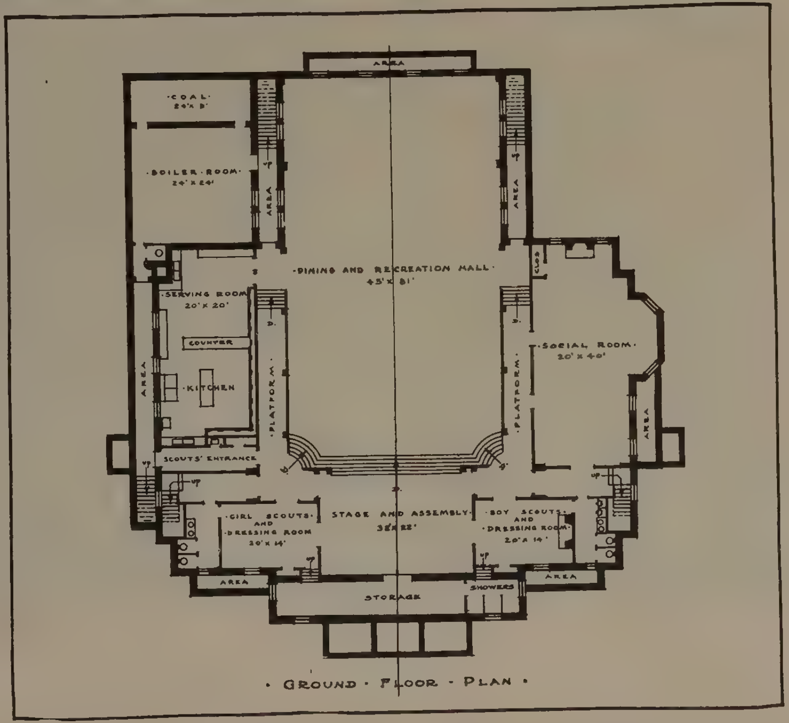
PARISH HOUSE, REFORMED PROTESTANT DUTCH CHURCH, FLATBUSH, BROOKLYN, N. Y.

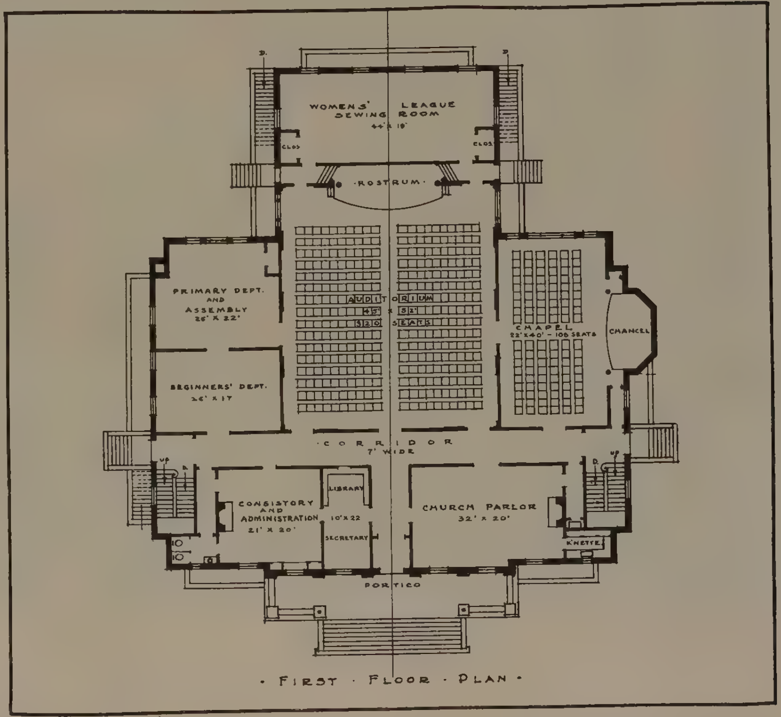
Meyer & Mathieu, Architects.



CHAPEL ENTRANCE.

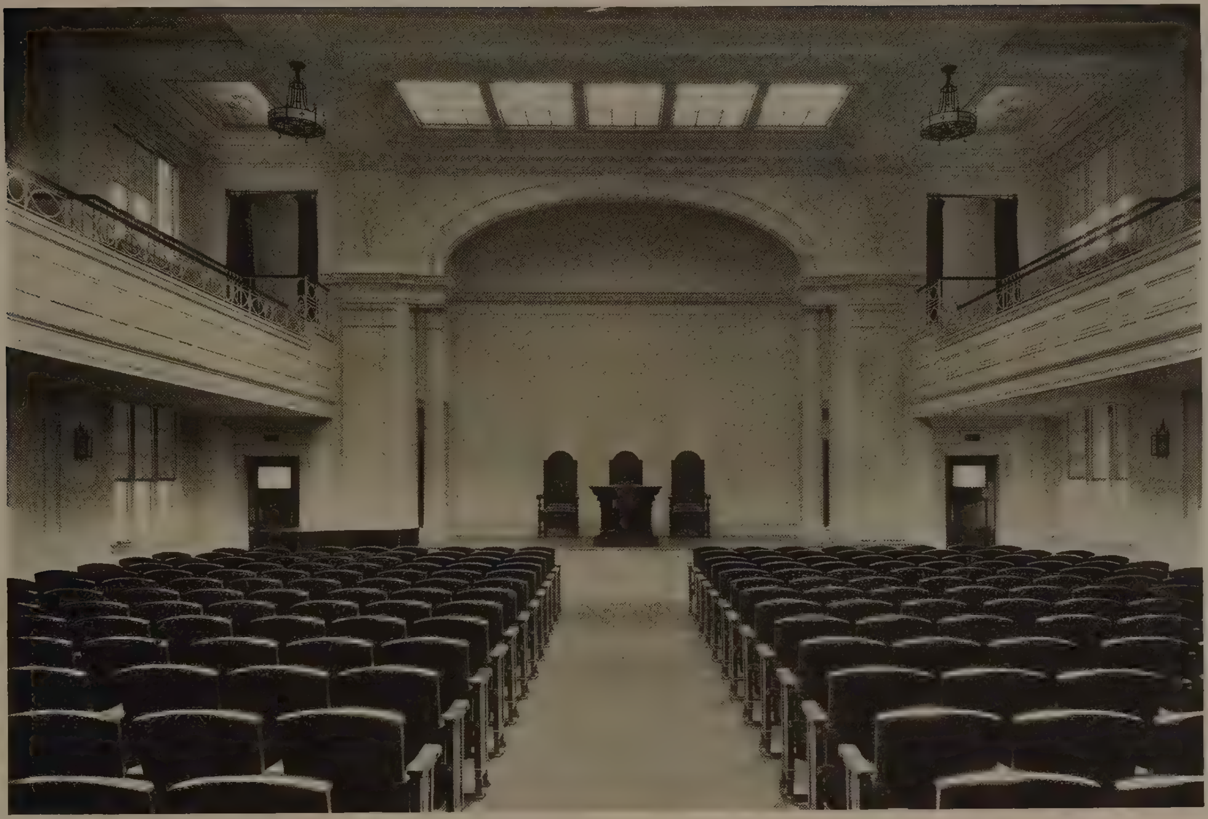


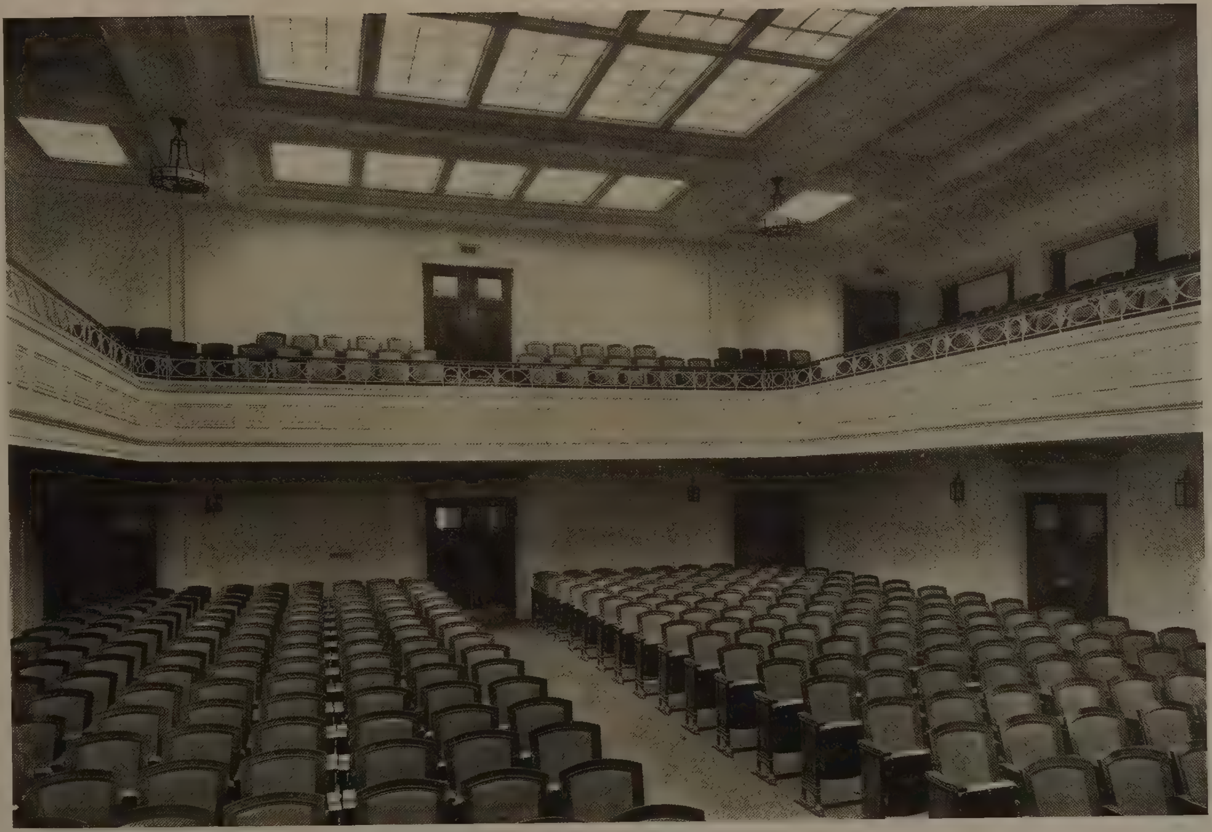




PARISH HOUSE, REFORMED PROTESTANT DUTCH CHURCH, FLATBUSH, BROOKLYN, N. Y.

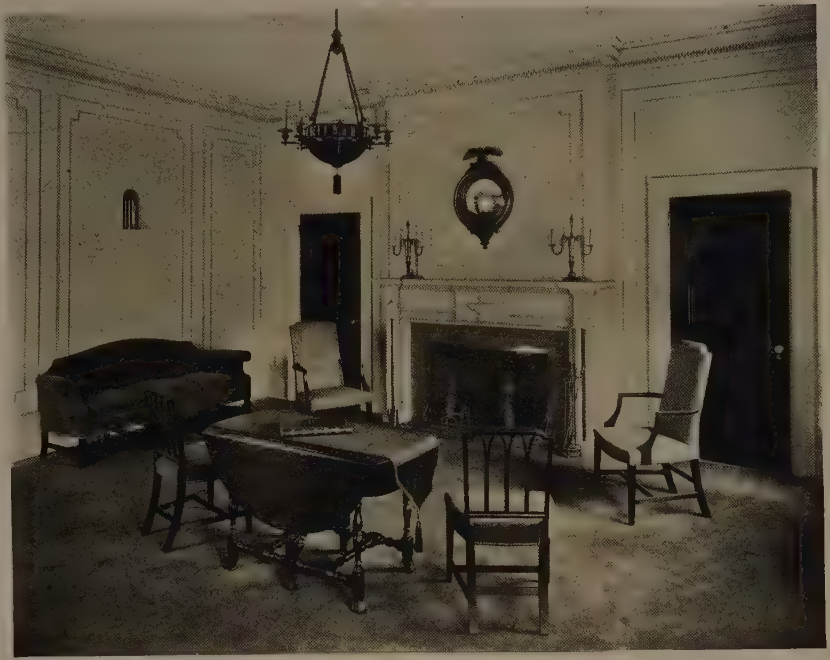
Meyer & Mathieu, Architects.



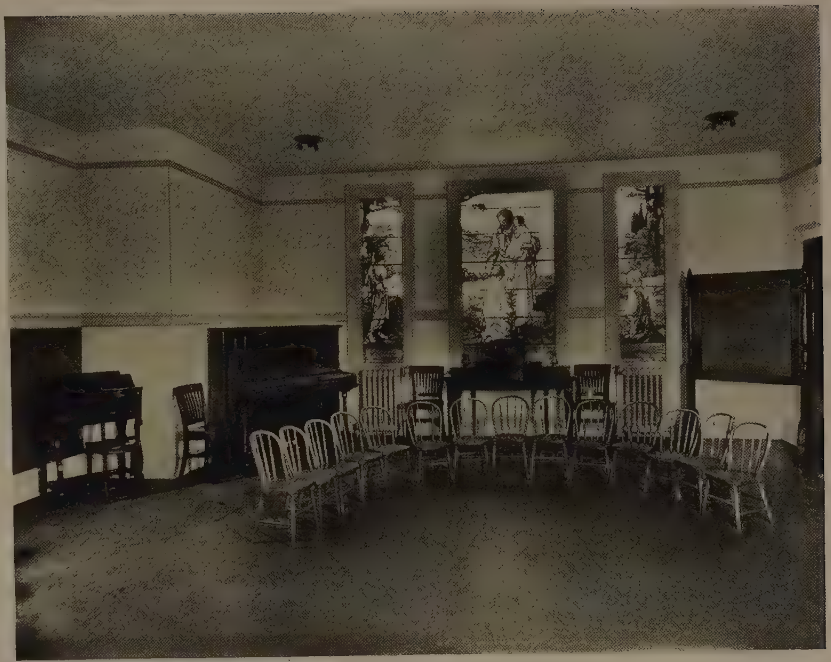


AUDITORIUM, PARISH HOUSE, REFORMED PROTESTANT DUTCH CHURCH, FLATBUSH, BROOKLYN, N. Y.

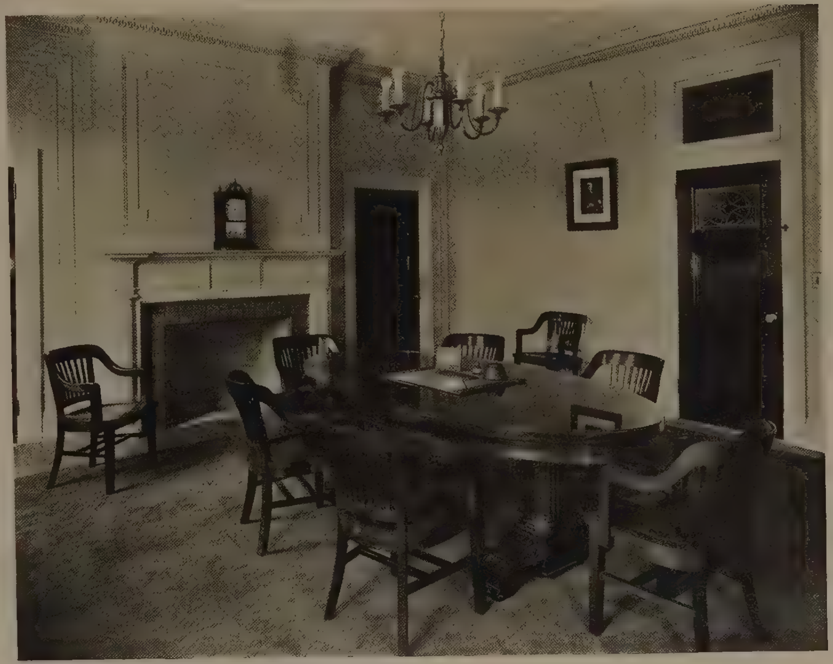
Meyer & Mathieu, Architects.



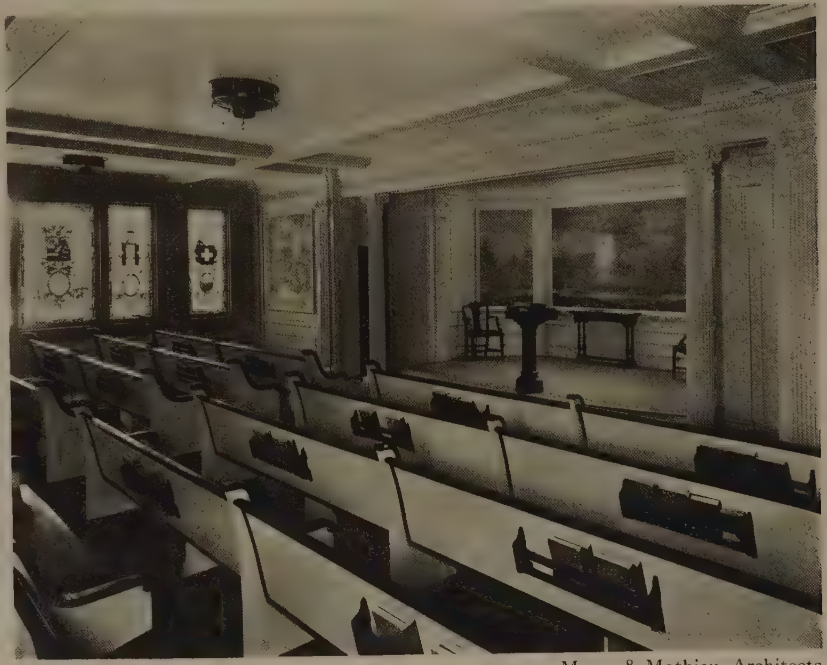
CHURCH PARLOR.



PRIMARY DEPARTMENT.



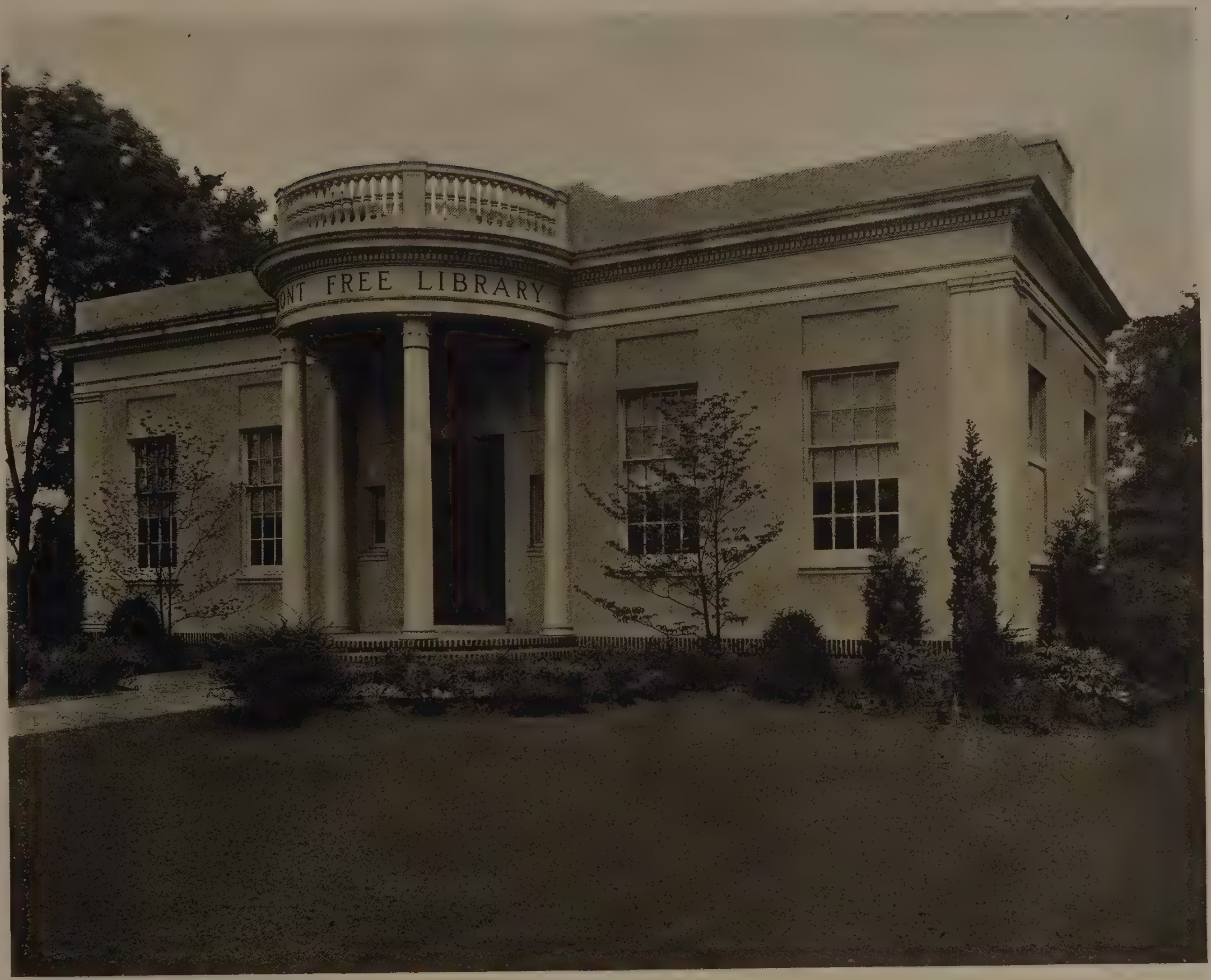
CONSISTORY AND ADMINISTRATION.

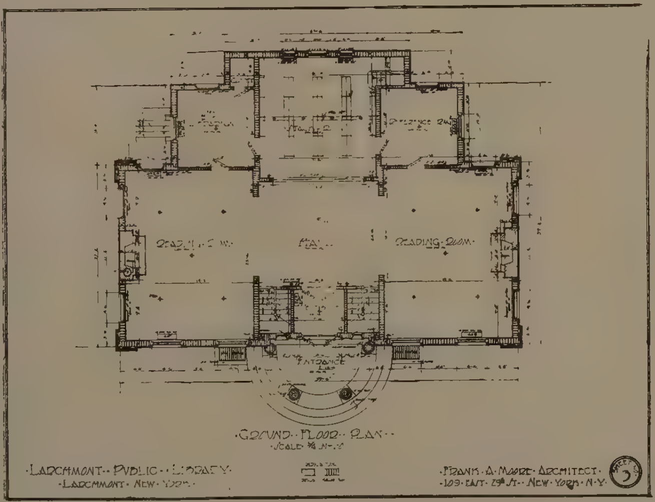


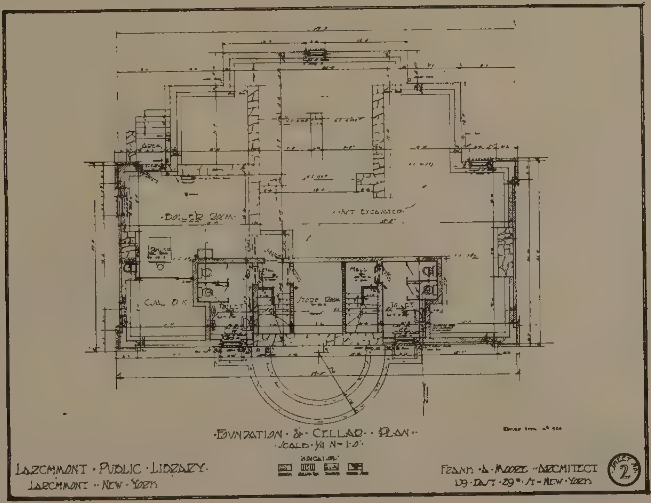
CHAPEL.

Meyer & Mathieu, Architects.

REFORMED PROTESTANT DUTCH CHURCH, FLATBUSH, BROOKLYN, N. Y.

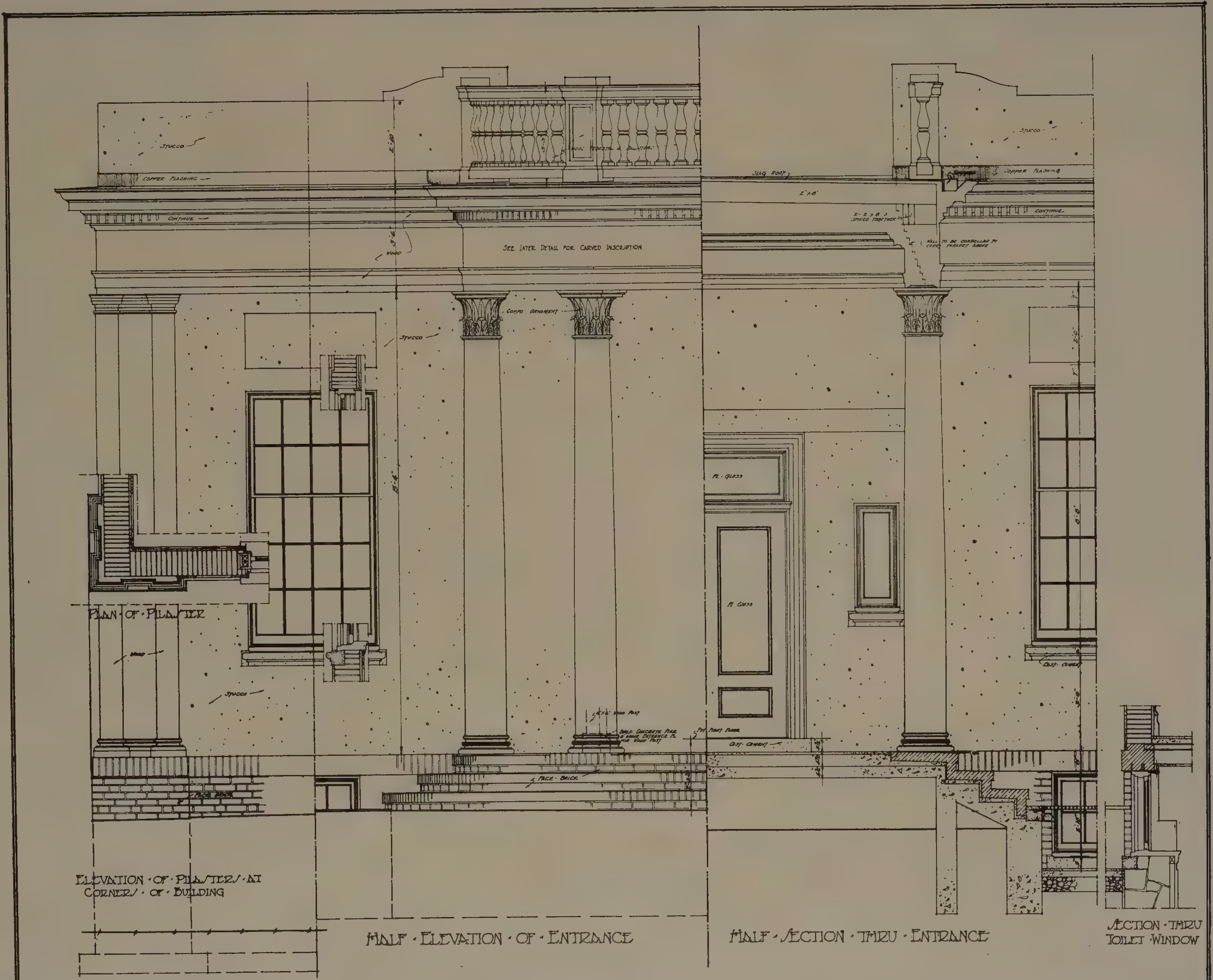






LARCHMONT FREE LIBRARY, LARCHMONT, N. Y.

Frank A. Moore, Architect.

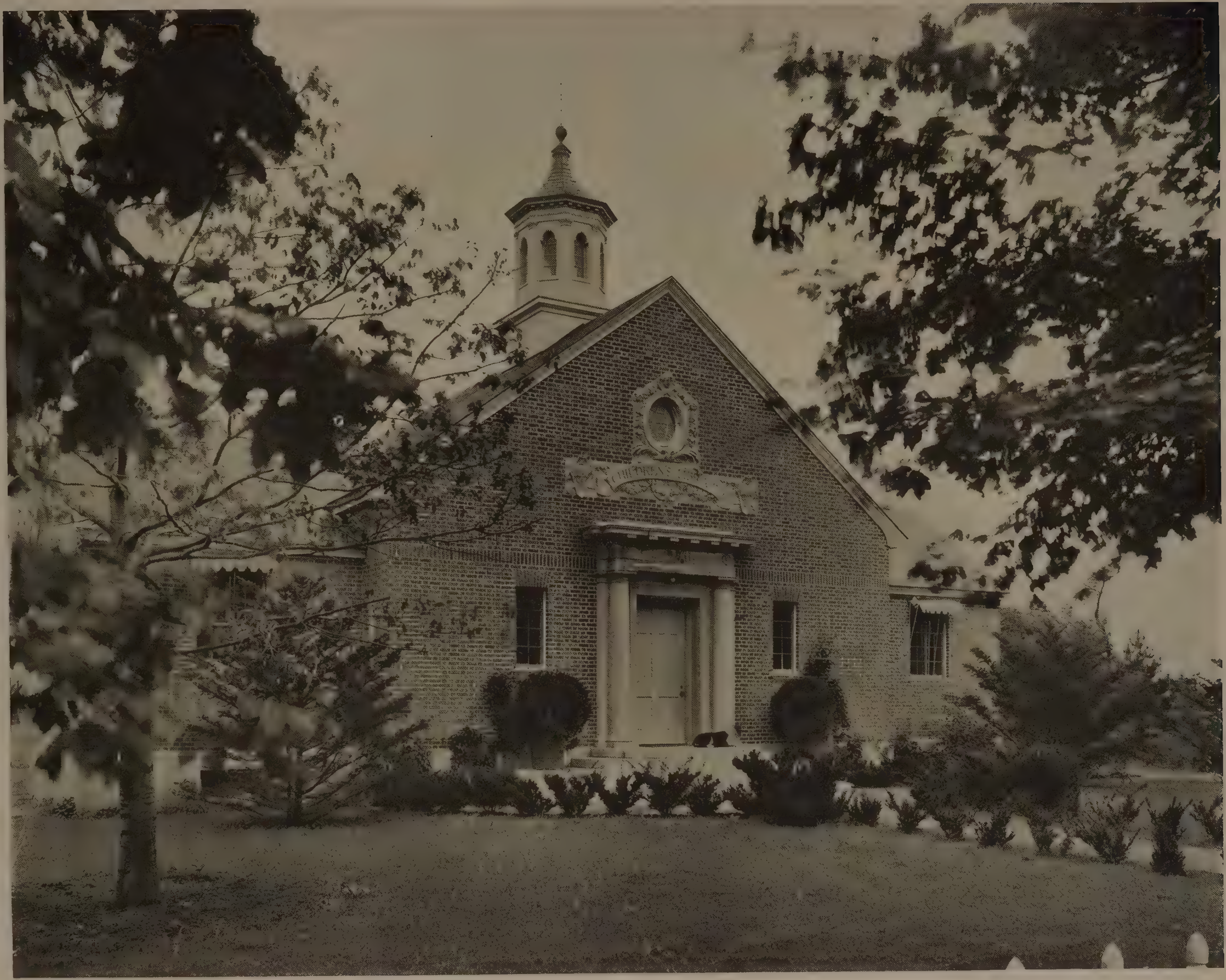

STUCCO
COPPER FLASHING
CONTINUE
WOOD
SEE LATER DETAIL FOR CARVED INSCRIPTION
COMPO ORNAMENT
STUCCO
SLAG ROOF
2"x8"
2-2x8's SPIKED TOGETHER
WALL TO BE CORBELLED TO CARRY PARAPET ABOVE
COPPER FLASHING
CONTINUE
PL. GLASS
PL. GLASS
CAST. CEMENT
PLAN OF PILASTER
WOOD
STUCCO
FACE BRICK
4"x6" WOOD POST
BUILD CONCRETE PIER 6" ABOVE ENTRANCE FL. FOR WOOD POST
FIN. FIRST FLOOR
CAST. CEMENT
FACE BRICK
ELEVATION OF PILASTERS AT CORNERS OF BUILDING
HALF ELEVATION OF ENTRANCE
HALF SECTION THRU ENTRANCE
SECTION THRU TOILET WINDOW

EXTERIOR · DETAILS
SCALE ~ 3/4 IN = 1 FT

LARCHMONT · PUBLIC · LIBRARY
LARCHMONT ·· NEW · YORK

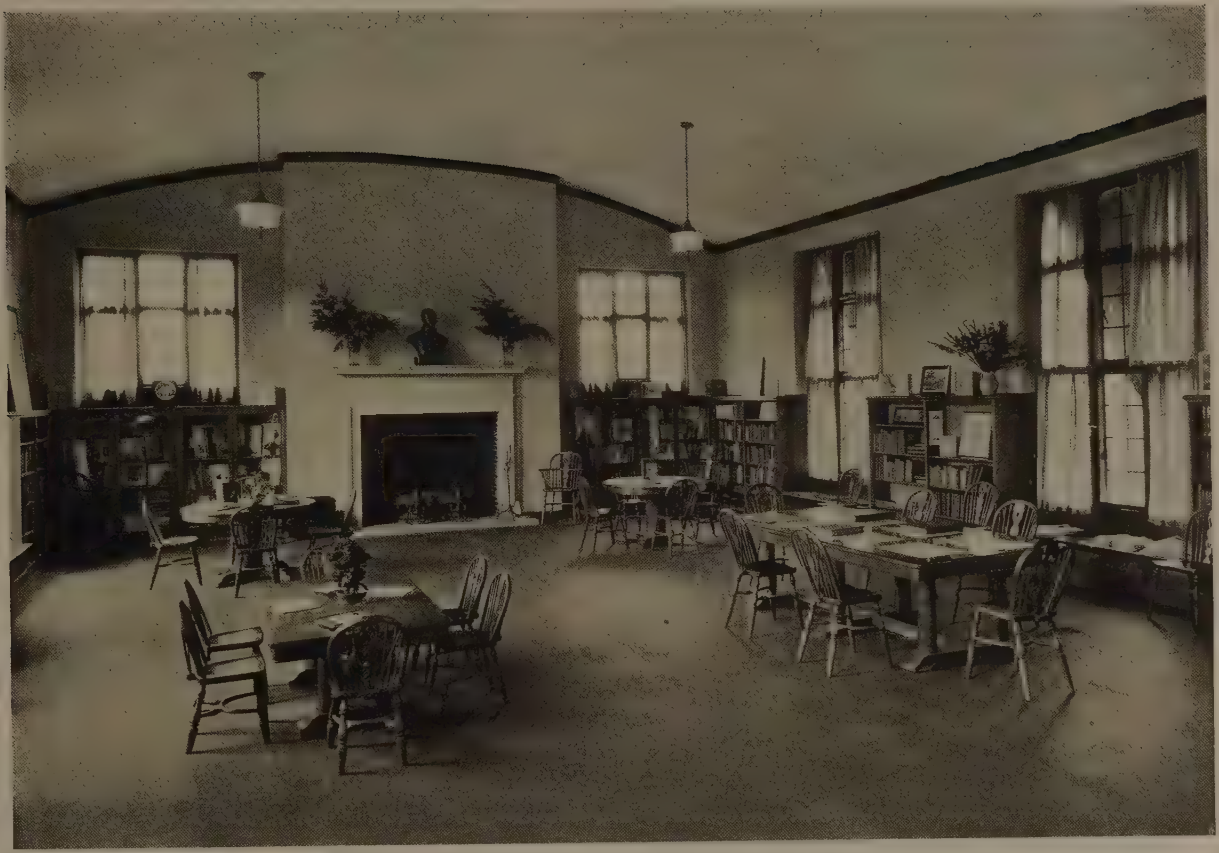
FRANK · A · MOORE ·· ARCHITECT
109 · EAST · 29TH · ST ·· NEW · YORK

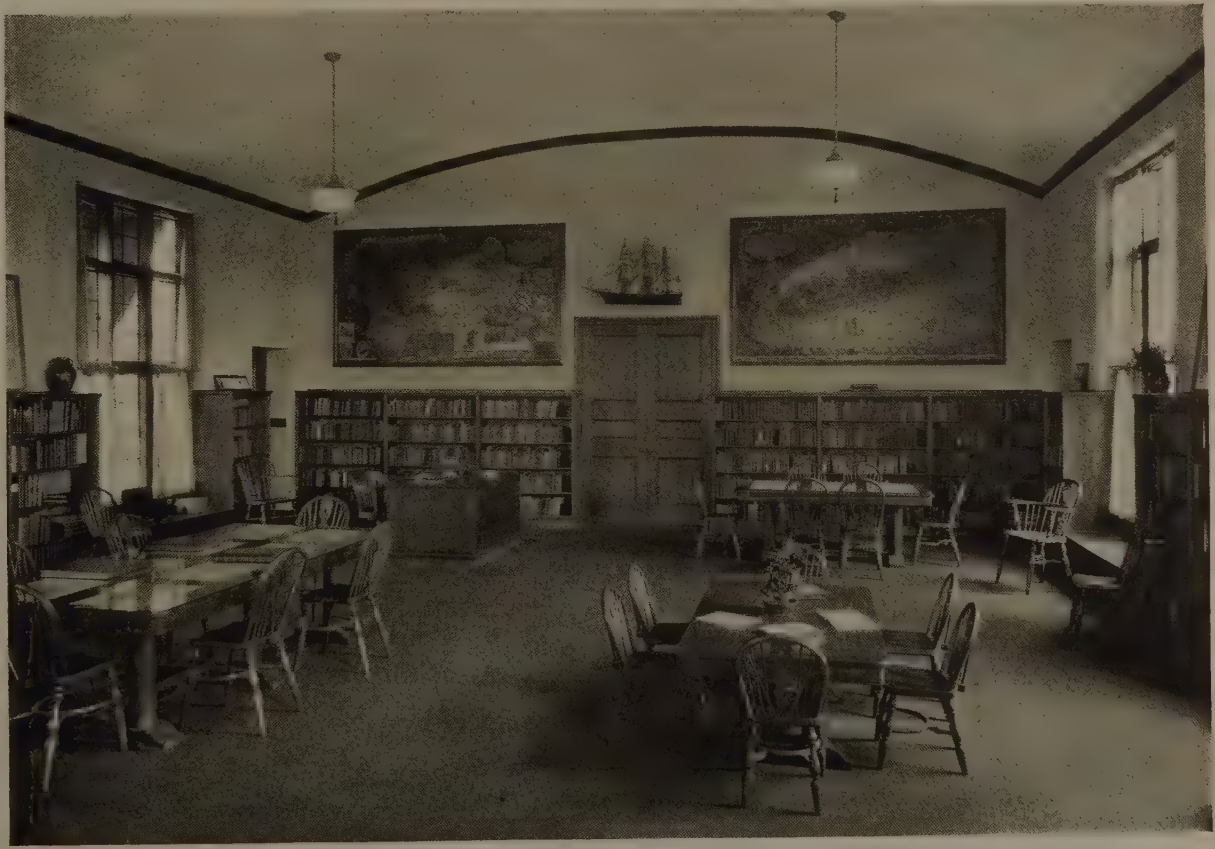
SHEET NO. 10



CHILDREN'S LIBRARY, ROBERT BACON MEMORIAL, WESTBURY, LONG ISLAND.

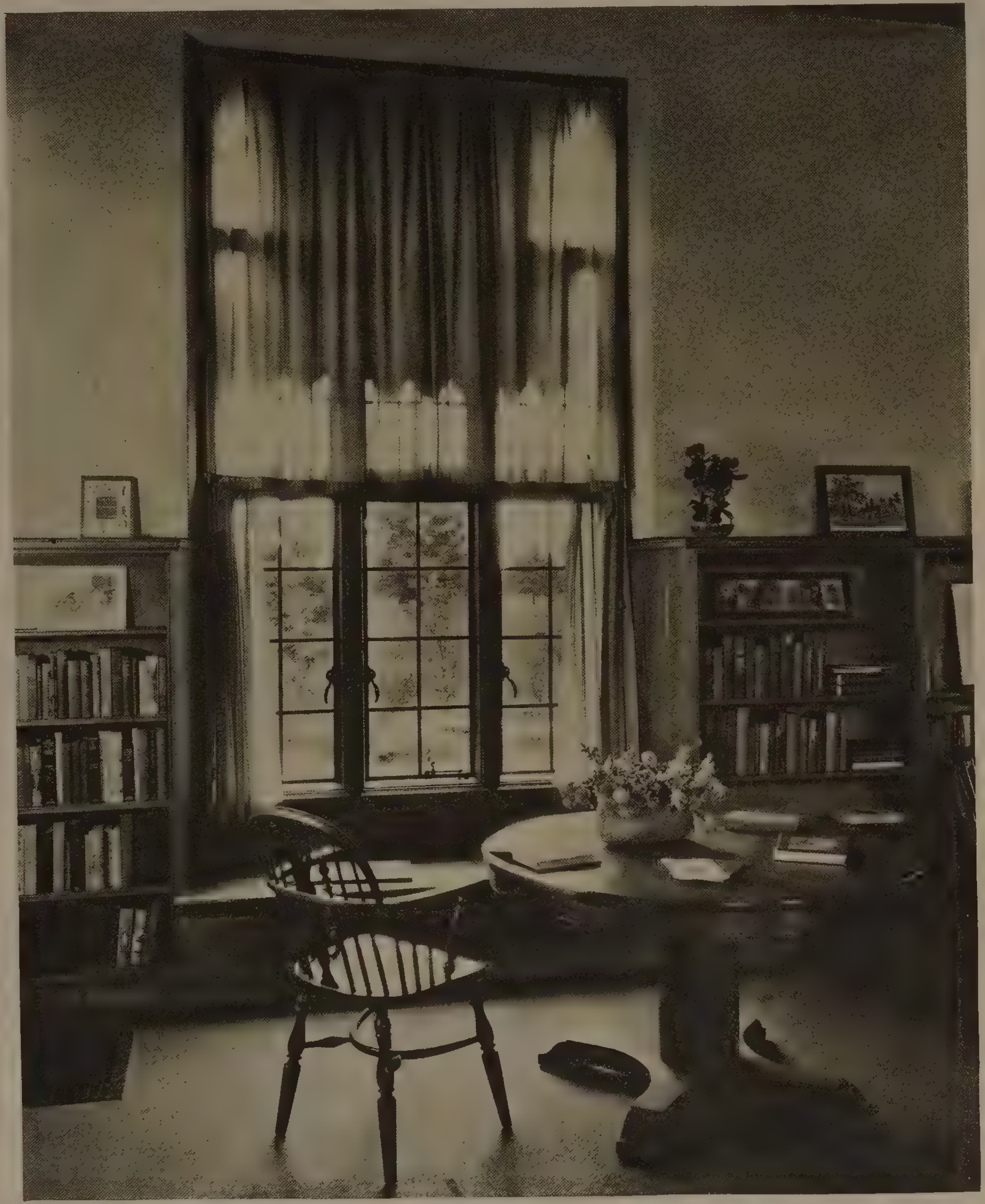
Peabody, Wilson & Brown, Architects.



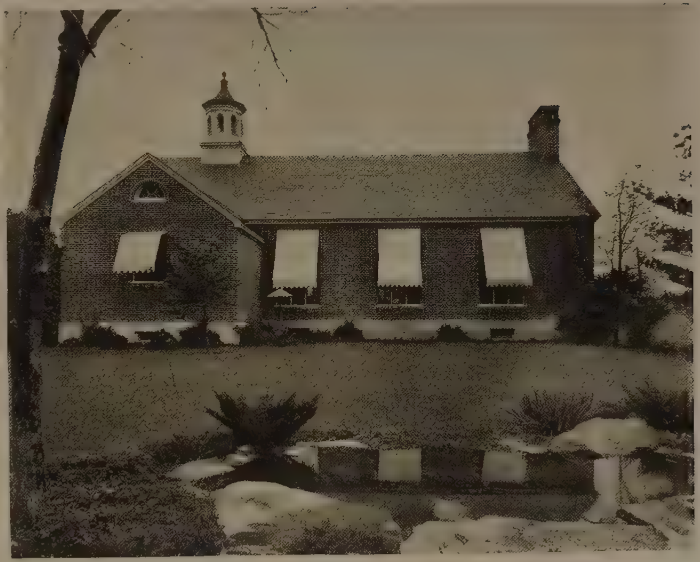


READING–ROOM, CHILDREN'S LIBRARY, ROBERT BACON MEMORIAL, WESTBURY, LONG ISLAND.

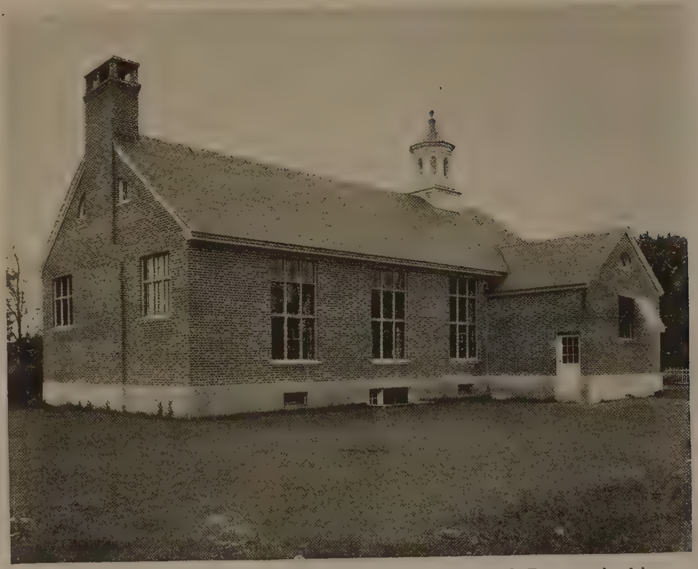
Peabody, Wilson & Brown, Architects.



WINDOW OVERLOOKING BIRD SANCTUARY.



GARDEN AND BIRD SANCTUARY.



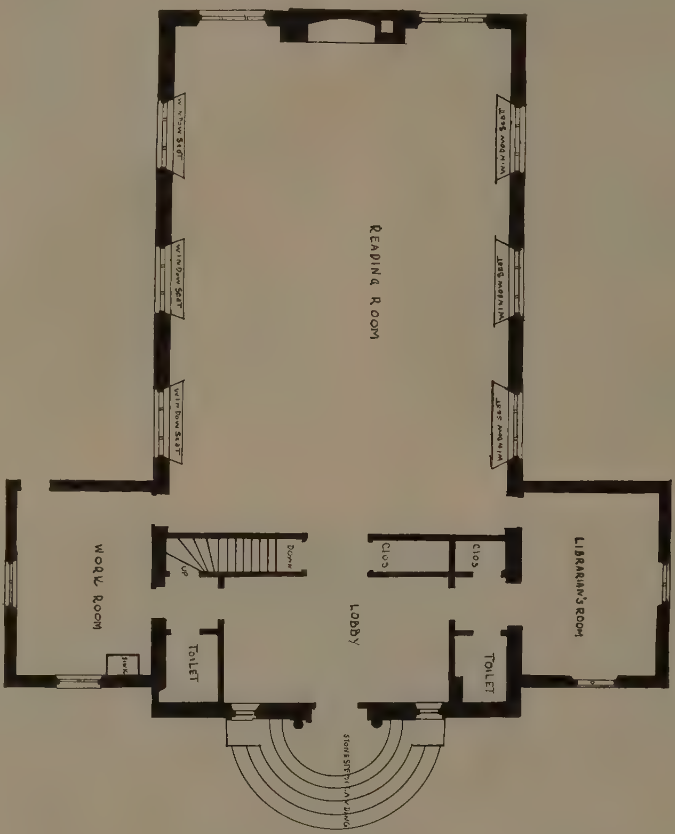
REAR AND SIDE VIEWS. Peabody, Wilson & Brown, Architects.

CHILDREN'S LIBRARY, ROBERT BACON MEMORIAL, WESTBURY, LONG ISLAND.

Children's Library, Robert Bacon Memorial

Westbury, Long Island

THE Children's Library in Westbury, Long Island, situated on School Street and close by the public schools, occupies the whole end of the block on which it stands. It is the only library organization and building devoted exclusively to the interests of children. Along the street front of the plot, a white picket-fence of old-fashioned design separates the lawn from the pavement; in the centre of this, a gate opens and a brick wall leads up to the front door of the building, set about fifty feet back from the street.



The building, of Colonial type of architecture, is of red brick with light stone trimmings. The front door itself is set between stone columns surmounted by a classic entablature, above which is an oval window in the gable end surrounded by carved stone arabesques and wreaths of fruit and flowers.

The roof of dark gray slate is crowned by a cupola with a window in each of its eight sides. Every evening that the Library is open to the public, the cupola windows are lighted from within and thus shine a welcome to all.

From the front door one enters a square hall and beyond this is the large book-lined reading-room, lighted on two sides by mullioned windows, in each of which is a window-seat which invites the children to linger and read in comfort.

The library room, 30 x 45, is furnished besides with chairs and tables and a huge stone fireplace opposite the entrance, where in winter a cheerful log fire burns. The walls above the bookcases are hung with large colored pictures and the vaulted ceiling adds a charm of the unusual. The whole end of the room at the entrance door is decorated with mural paintings by Stewart Travers, colorful scenes of the kind to catch and hold youthful imaginations.

The reading-room makes up the bulk of the building, except for two small rooms on either side of the entrance hall (12x16 each); on the right the librarian's office and on the left the workroom where books are unpacked and sorted and withdrawn for rebinding. In short, a place apart from the reading-room, where all noisy or otherwise disturbing work can be attended to without interfering with its use.

All of the walls in the building are painted in cheerful, quiet colors, and the woodwork, doors, bookcases and other trim is of butternut, stained and waxed to a soft brown finish. The floors throughout are of noiseless cork tiling.

Everything has been done and no expense spared to give a suitable cheerful and homelike effect appropriate to the uses for which the building is intended. Permanence, cleanliness, and economy of upkeep have been the watchwords throughout.

The equipment, management, and delightfully intimate and friendly atmosphere of this charming little library are quite unique. The landscape setting is most attractive and a part of the grounds has been set aside, with drinking pool, feeding place, and nesting-boxes, as a bird sanctuary.

What Is Taking the Place of Chestnut in Our Forests?

THE Appalachian Forest Experiment Station, established at Asheville by the United States Forest Service, is giving much time and effort to the problem of what will fill in the gaps in Eastern forests caused by the onslaught of the chestnut blight, which is sweeping unchecked through the Southeastern forests at present in its course from New England south. Chinese varieties of chestnut, supposedly immune from the blight, have been tried in North Carolina, but have not so far proved able to withstand the rigors of the climate. In connection with further experiments along this line, Mr. C. F. Korstian, of the Appalachian Station, has recently been studying natural reproduction in more northerly forest areas ravaged by the blight. Of all species replacing chestnut in Pennsylvania, New Jersey, and southern New England, where chestnut was practically wiped out some years ago, Mr. Korstian found the chestnut oak to be one of the most abundant and widely distributed. This is true as far south as the Carolinas. In general, Mr. Korstian found the smaller blanks in the forest filled by he crowns of neighboring trees, notably of oak, as a result of release from the chestnut's competition. Larger openings are for the most part being filled by seedlings and sprouts of oaks, white ash, and hickory, all valuable species. In northern New Jersey pine is also coming in naturally in these openings.

Co-operative Apartment-Houses of the Smaller Type: How to Handle Them

By Roy G. Pratt, Architect

Member Executive Committee, Apartment Division, National Real Estate Board

IN this article I have outlined the methods which I have used in Philadelphia and Baltimore. In these cities very little is known about co-operative apartments and at the present time there have been only three buildings erected in each city. Practically all of the individual apartments have been sold. In most instances the purchasers have been those who have known of the advantages of joint ownership from other cities where the plan has been successfully worked out.

In order to have first-hand information regarding the attitude toward the co-operative movement throughout the United States, a letter was written to the secretaries of all the real-estate boards asking them to advise if apartment buildings had been built and sold on the joint-ownership plan in their cities. From the replies received it develops that there are only sixteen cities in the entire United States where co-operative apartments have been erected. Three cities report a trial, but also a failure.

There are many varieties of small co-operative apartment-houses. It is even possible to design one small enough to contain just two apartments, the exterior having the appearance of a small residence. A suggestion along this line is shown among the plans exhibited here. There are two interpretations of the meaning of the term "small co-operative apartments."

(1) A building containing a small number of apartments with suites of living-room, dining-room, pantry, kitchen, two bedrooms and two baths.

(2) A building having a large number of apartments but with small suites of living-room, bedroom, kitchen, dining alcove, and bath—called in many cities "efficiency apartments."

In Philadelphia and Baltimore, the apartment-houses have six or eight families in three or four story buildings—and containing six rooms, two or three baths, maids' rooms and individual garage. And here I might add that if the co-operative plan is new in any city, my advice to the pioneers going into that city is to content themselves for the first year or two with the building of several six or eight family buildings and later on, after the inhabitants are educated (that is exactly what must be done with them so they will even consider the advisability of buying an apartment)—after this is accomplished then there is time enough to consider the personal monetary gain through the erection of the larger buildings. Philadelphia is the third-largest city in the United States and yet after two years of so-called education there are only three buildings there which have been sold on the 100 per cent co-operative plan. I know of three large operations which were efficiently planned and were full of merit—but the men who were back of them told me that the city was not ready for the co-operative idea yet and that there was much more missionary work necessary. I am outlining the Philadelphia situation only as a warning to any one seeking to develop new territory. Much patience is necessary to put over this new idea and my plan in Philadelphia has been to select the best residential apartment sections and build one or two six or eight family buildings in each section and after these have been sold decide on the next best type. If a building is properly built and satisfies the demands of the apartment-house dweller—then the money spent for a number of small apartment-houses placed in carefully selected locations will be the best kind of advertising for future business. Opening up new territory where the co-operative idea is wholly unknown and untried is a difficult problem. On the other hand, the co-operative plan of owning an individual apartment is so sound that as soon as you have convinced your city of its real value your future business will be assured. The writer has accepted an invitation to go to Miami, Fla., to erect a twenty-four-family apartment on the co-operative plan—so you can see he has faith in the idea or he would not branch out and open an office in territory new to him. Feeling that the first stage of educating the public has been passed in my city, this coming year will find the Philadelphians being offered the purchase of apartments on the 100 per cent co-operative plan in one of four buildings, an eight, a ten, an eighteen and a twenty-four family. Incidentally the eighteen-family building will have three bedrooms in each apartment. For information and suggestions, only for those who are considering the building of small apartment-houses, the elevations and floor plans of all my Baltimore and Philadelphia buildings, including the larger ones for this year, are shown here.

As this article is presented primarily for the benefit of those unfamiliar with the handling of these small apartments, I shall give an account of my personal experiences in Philadelphia.

First, the construction or holding company is organized as a corporation would be. The land and the building to be erected would remain in its possession until completion, at which time a second corporation is formed, the stock in this latter company being bought by the purchasers of the individual apartments.

The selection of the site is of utmost importance. A building costs practically the same in any location in a city, but its selling value depends on its location. It should be in the vicinity of railroad and trolley lines, and schools, churches, and stores. It is a real asset if the residences in the neighborhood of the apartments sell for five or six thousand dollars more than the individual apartments.

Much attention should be paid to the design of the building—the exterior should present a warm and inviting appearance. Considerable money spent for shrubbery and landscaping is not wasted. It must always be remembered that the apartments are to be sold, not rented, and when a person purchases an apartment, he is thinking in terms of a home and every detail which he would expect in buying an individual residence should be incorporated in the apartment you are trying to sell him. Particularly when the detail of design of the interior is being considered, the layout and size of the rooms is of primary importance. If an apartment is to be rented the rooms may be small in size with low ceilings but if it is to be sold, it is the writer's opinion that the ceiling should be nine feet in the clear and the minimum size of rooms should be as follows:

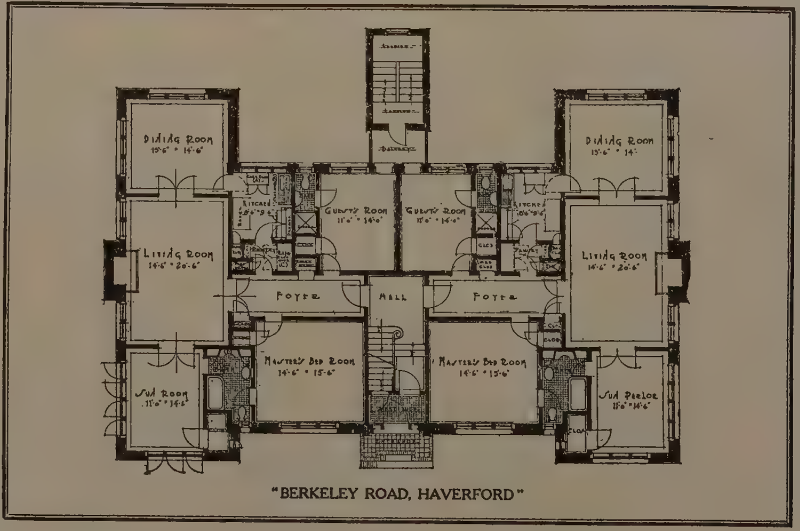
Living-room.............	14′×21′
Dining-room............	13′ 6″×14′ 6″
Kitchen................	8′×11′
M. B. R................	13′ 6″×14′ 6″

DESIGN - FOR
SIX FAMILY - APARTMENT -
FOR THE JOINT-OWNERS CONSTRUCTION-CO -
4110 - N - CHARLES STREET - AVE -

Baltimore, Md. Six-family co-operative. Same plan as Berkeley Arms.

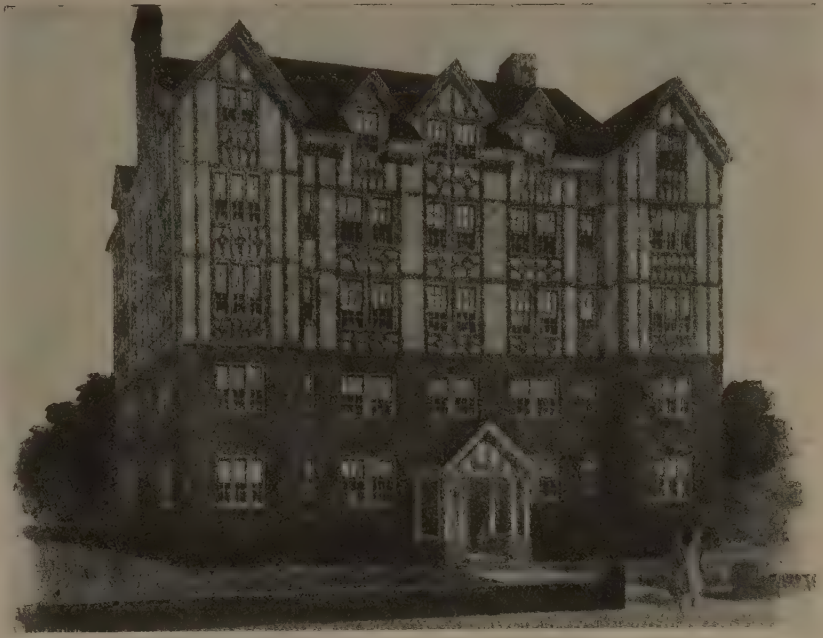
Berkeley Arms, Haverford, Pa.

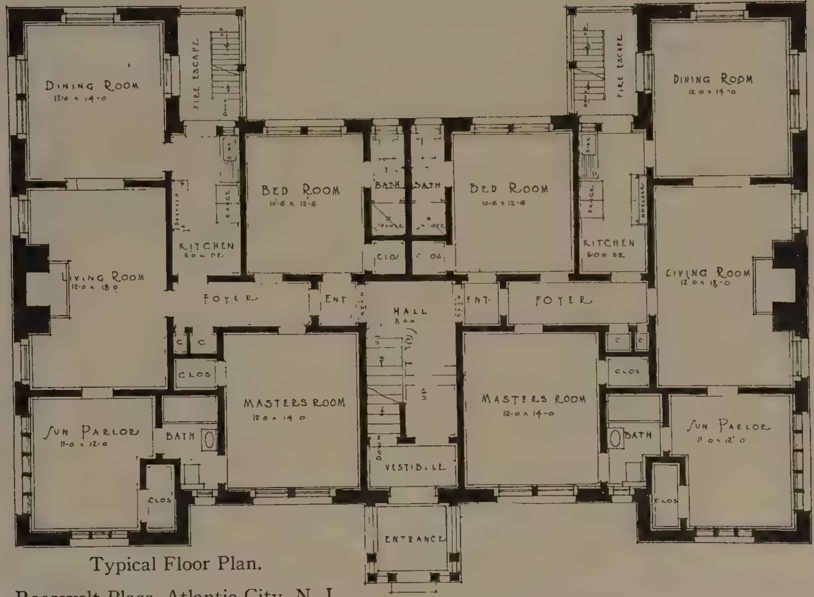
Carpenter Lane, Germantown Pa. Eight-family co-operative. Same plan as Berkeley Arms.



Berkeley Arms, Haverford, Pa. Six-family co-operative. Roy G. Pratt, Architect.

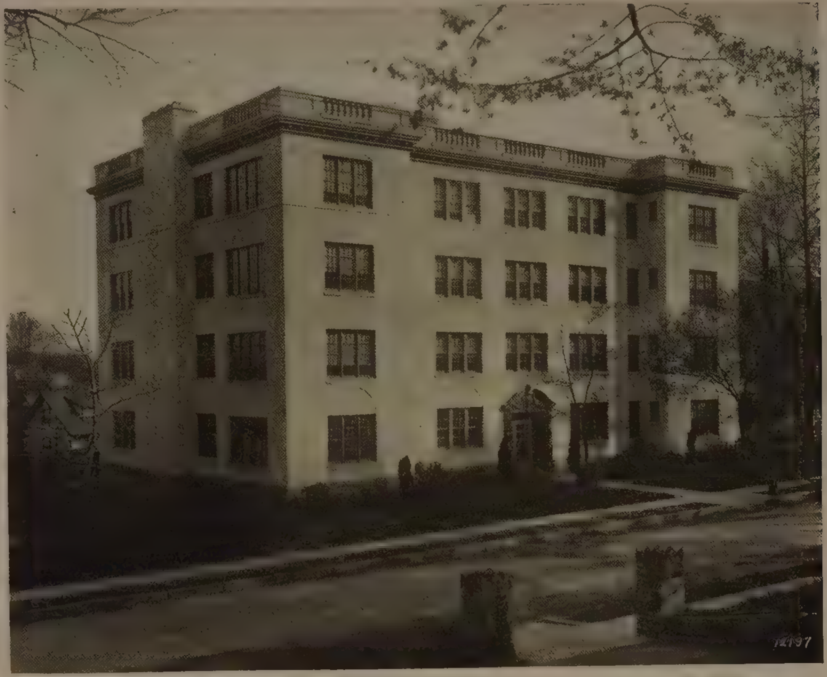
CO-OPERATIVE APARTMENT-HOUSES OF THE SMALLER TYPE.

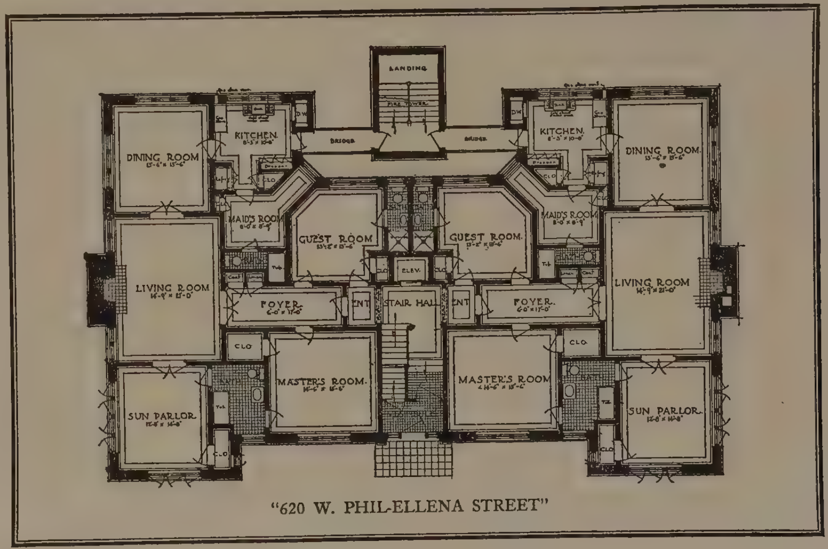




Typical Floor Plan.

Roosevelt Place, Atlantic City, N. J.
Eight-family co-operative.





620 West Phil-Ellena Street, Germantown, Pa.
Eight-family co-operative.

Roy G. Pratt, Architect.

CO-OPERATIVE APARTMENT-HOUSES OF THE SMALLER TYPE.

G. B. R.	11′×13′
Sun-porch	10′×14′
Maid's room	7′×10′

The sleeping quarters should be as far removed as possible from the living-room. In the writer's opinion, probably eighty-five to ninety per cent of all apartments have been purchased because they have passed the wives', not the husbands' inspection and approval. About all the husband gets for his check is the shower bath. As long as the woman has to be pleased, particular attention should be paid to the design and arrangement of the bathrooms and kitchens. The fireplace burning wood logs always appeals to the woman. In Philadelphia gas logs are popular, so each fireplace has a gas connection. Ample closet-rooms with electric lights should be provided. The more electrical outlets and base receptacles, the more pleasing. The above details are immediately noticed by the woman purchaser. Modern apartments don't seem complete these days without an incinerator, a dumb waiter, mechanical refrigeration, and a complete laundry unit. Other items of less importance but which are, in my opinion, selling-points, are wall safes, built-in china closets in dining-rooms, ventilator fans in kitchens, bathroom electric heaters, vacuum systems, ironing-boards, towel-driers in kitchen, full-length mirrors in each bedroom, radio outlets, combination sink and dish washing-machine. These are items which seem to appeal to the purchaser and while the cost per apartment is increased, yet the selling is made much easier.

As an accessory, a disappearing bed has a real value. Another feature which interests a person buying before the building is completed is that he, or rather, she, may make certain selections. Certain allowances are made for the electric fixtures, the wall coverings, the gas range, and the fireplace mantel and if a purchaser cares to select any of the above items it is his privilege and he may increase the costs to whatever limit he desires. Also he may change the arrangement of the partitions in his own apartment if the strength of the building is not impaired. The buyer also may have any additional work done in his apartment by our workmen at a cost of labor and material plus ten per cent. So, with these individual selections, a purchaser feels that he, and not the architect, designed his apartment.

All apartment buildings four stories or more, which are to be co-operatively sold, should have an automatic elevator. True the largest apartment-house group in the world—the Roosevelt, in New York City, is six stories, and is a walk-up—but it would be a very difficult matter to sell the individual apartments on the fifth and sixth floors. The other extreme is the eighteen-family to be built this year in Elkins Park, Philadelphia. It will be a three-story building, and will have an automatic elevator. In the writer's opinion this is a needless expenditure of money. The first floor will never use it, the second floor can walk the one flight upstairs quicker than getting in and out. Owners on these floors will object to paying their share of maintenance just for the accommodation of the top floor. It would be better to reduce the selling price on third floor.

There is considerable discussion just now as to the proper location of the maid's room and bath. Some apartments have been built with the basement windows above grade and servants' quarters arranged for there. Others, particularly in the larger buildings, have laid out the entire top floor in maids' rooms. In both places, the maids are given every opportunity to meet and discuss each other's wages, privileges, etc. From the writer's discussion with his purchasers, having the maid's room and bath in the apartment itself is much more satisfactory and his present and future designs will be drawn in this manner.

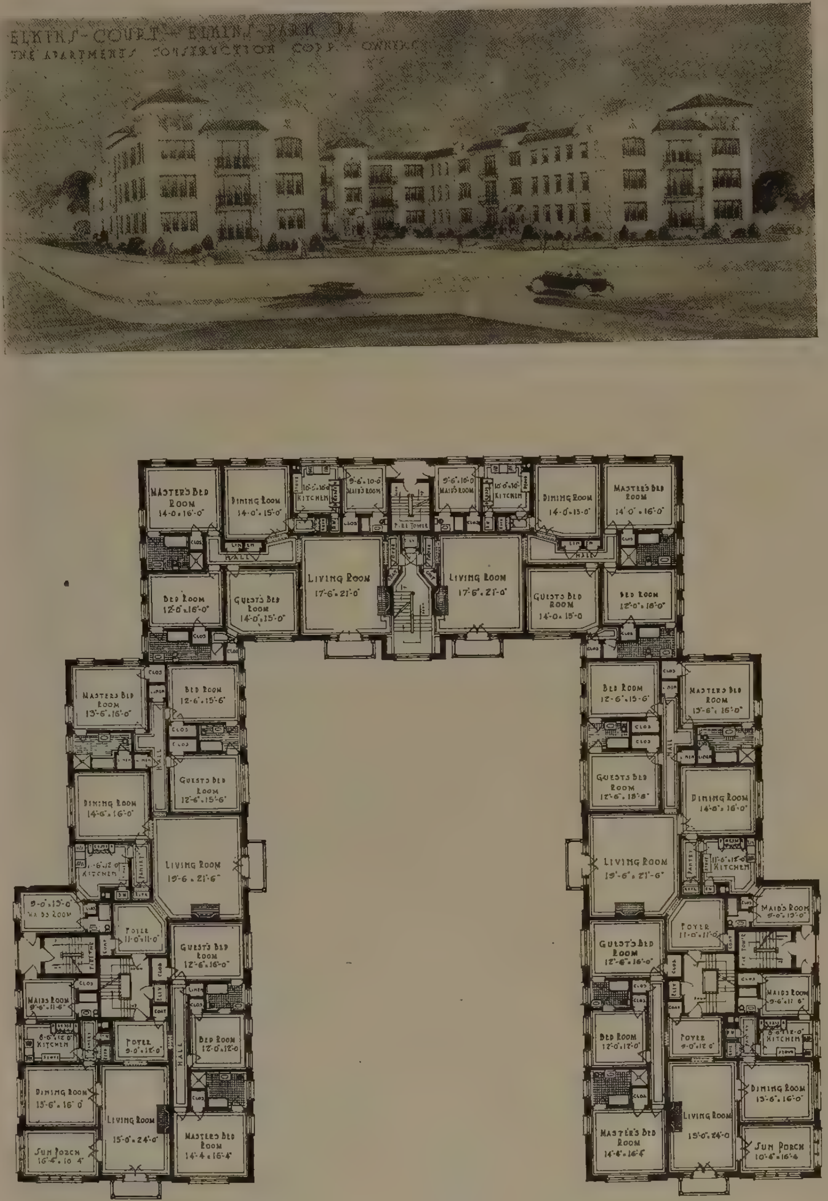
Another big selling-point is the individual garage which is sold with each apartment. The garage may be built either at the rear of the property or in the basement. Arrangements should be made for several double-garages as many times a sale might be lost if accommodations for two cars are not possible.

Having finally decided upon just which of the above items you think necessary for your particular apartment, the next step is to arrive at the selling price per apartment. This is the summation of the lot cost, the building cost, financing cost, real-estate commission, and the profit. The total will be for the entire building and the next step will be to prorate this amount among the various apartments, depending on number of square feet, location in the building, exposure and other points of advantage. The amount of mortgage or mortgages is the next consideration. In financing a co-operative apartment-house, the amount of mortgages placed on the property has been subject to considerable discussion. Some contend that fifty per cent of the value of the land and building is sufficient. There are others who feel that it is perfectly safe to place first and second mortgages up to seventy per cent or seventy-five per cent, thereby making the cash required considerably less. The general practice in New York City and Chicago is to place only first mortgages and for only about fifty per cent of the land and building value. In Philadelphia, first and second mortgages are placed up to seventy-five per cent and the writer has a source whereby the purchaser may borrow half of the cash required for the stock certificate and have three years to pay it off. This is working successfully and will be used much more in the future in our city.

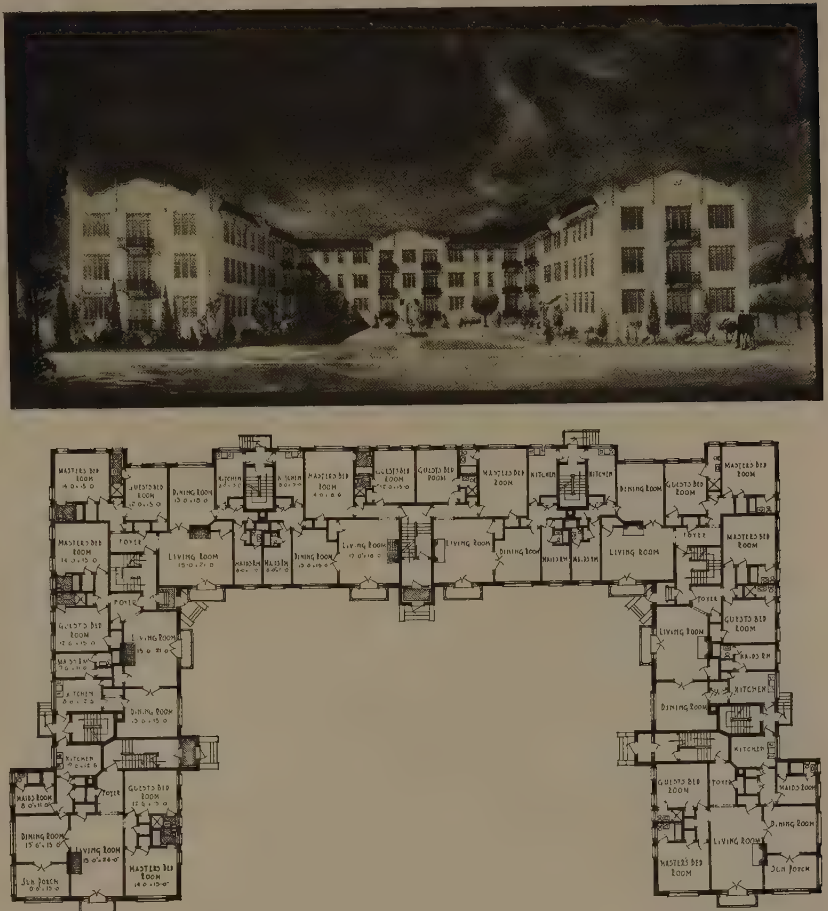
The next step is to sell the apartments and this is, particularly in the new territory, the hardest problem. In cities where the co-operative plan is unknown much newspaper advertising is necessary and this must be along educational lines, telling what the plan is, the good points, etc. Then the particular apartment building must be featured as to its interesting points. The showing of floor plans in the newspapers seems to reach the prospect best. Also, there should be in your office a carefully prepared prospectus giving the elevation and the floor plan of your apartment-house, several paragraphs describing the joint ownership plan, and also the details pertaining to your building. The more elaborately this prospectus is printed, the more dignity and prestige will be given to your development. The writer feels that the financial plan showing the cash required, how payments may be made, and the approximate operating expenses, should be printed in the prospectus, as it saves needless explanations at a later time.

To keep the co-operative idea before the public, whenever an apartment is sold the real-estate editor of your papers should be given the name of the purchaser. Two apartments have been sold in Philadelphia directly as a result of these notices. Large, artistic signs in carefully selected colorings and wording should be erected on the grounds where the apartment is to be built.

Assuming that all the individual apartments in the building have been sold, the final stage of the development is the transferring of the land and building to the new corporation, which is composed entirely of those who have purchased the apartments. Any person that intends to enter the co-operative apartment field will do well first to purchase the book published by the Co-operative Apartment Association of Chicago, "Standardized Methods for Co-Operative Apartment Buildings." In this valuable book will


ELKINS-COURT - ELKINS-PARK, PA.
THE APARTMENTS CONSTRUCTION CORP. OWNERS
MASTER'S BED ROOM 14-0 x 16-0
DINING ROOM 14-0 x 15-0
KITCHEN
MAID'S ROOM
LIVING ROOM 17-6 x 21-0
BED ROOM 12-6 x 16-0
GUEST'S BED ROOM 14-0 x 15-0
LIVING ROOM 15-6 x 21-6
FOYER
SUN PORCH
HALL

Elkins Court Apartments, Philadelphia, Pa. Eighteen-family co-operative.

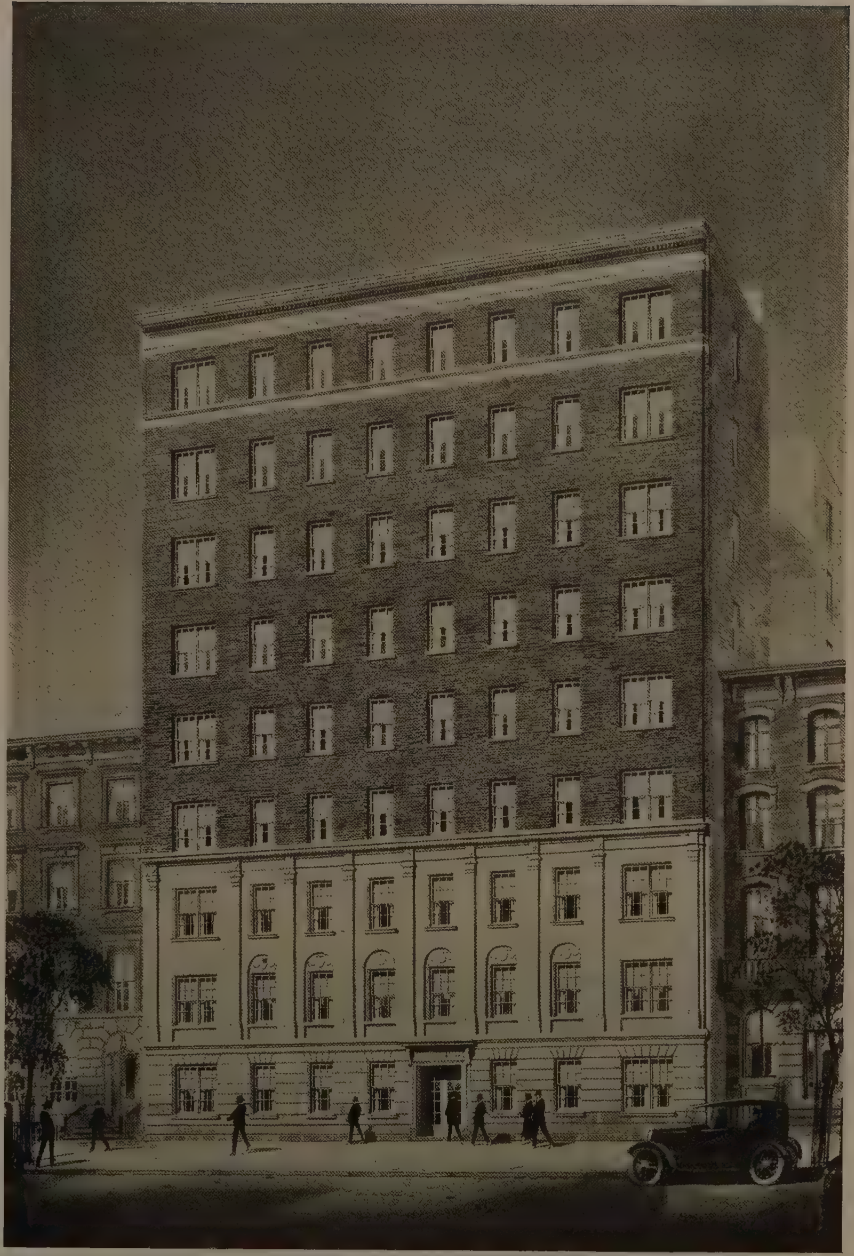


Miami, Fla. Twenty-four-family co-operative.

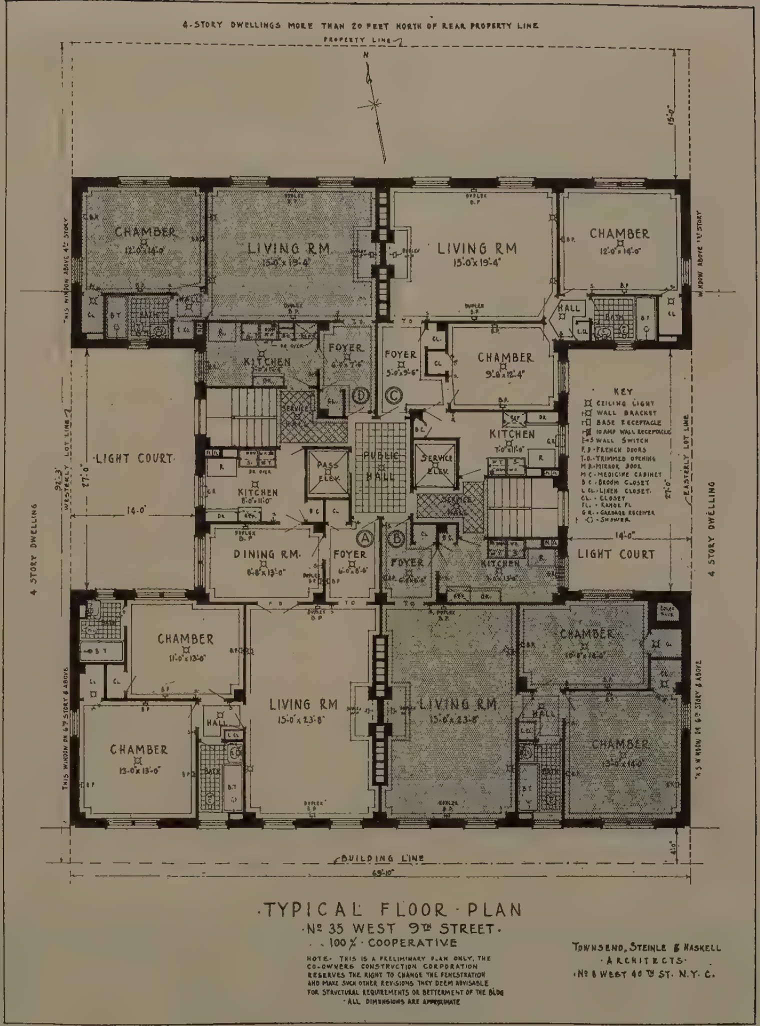
be found all the necessary forms needed by the corporation having final possession of the property. The forms of lease and stock certificate, and samples of all organization papers needed will be found in this volume. It has been of real assistance to the writer in his Philadelphia operations and very few changes legal or otherwise have been necessary to meet our local conditions.

After the final transfer has been made and you have been paid in full for your labors, if you intend to continue to build these co-operative apartments, don't drop the purchasers of your new apartments. Give them personal attention, help them to get running smoothly, offer your advice as to the management of the building. If you expect them to talk to your future prospects favorably, you must make them continue to feel that they have made a wise and satisfactory investment.

CO-OPERATIVE APARTMENT-HOUSES OF THE SMALLER TYPE.
Roy G. Pratt, Architect.



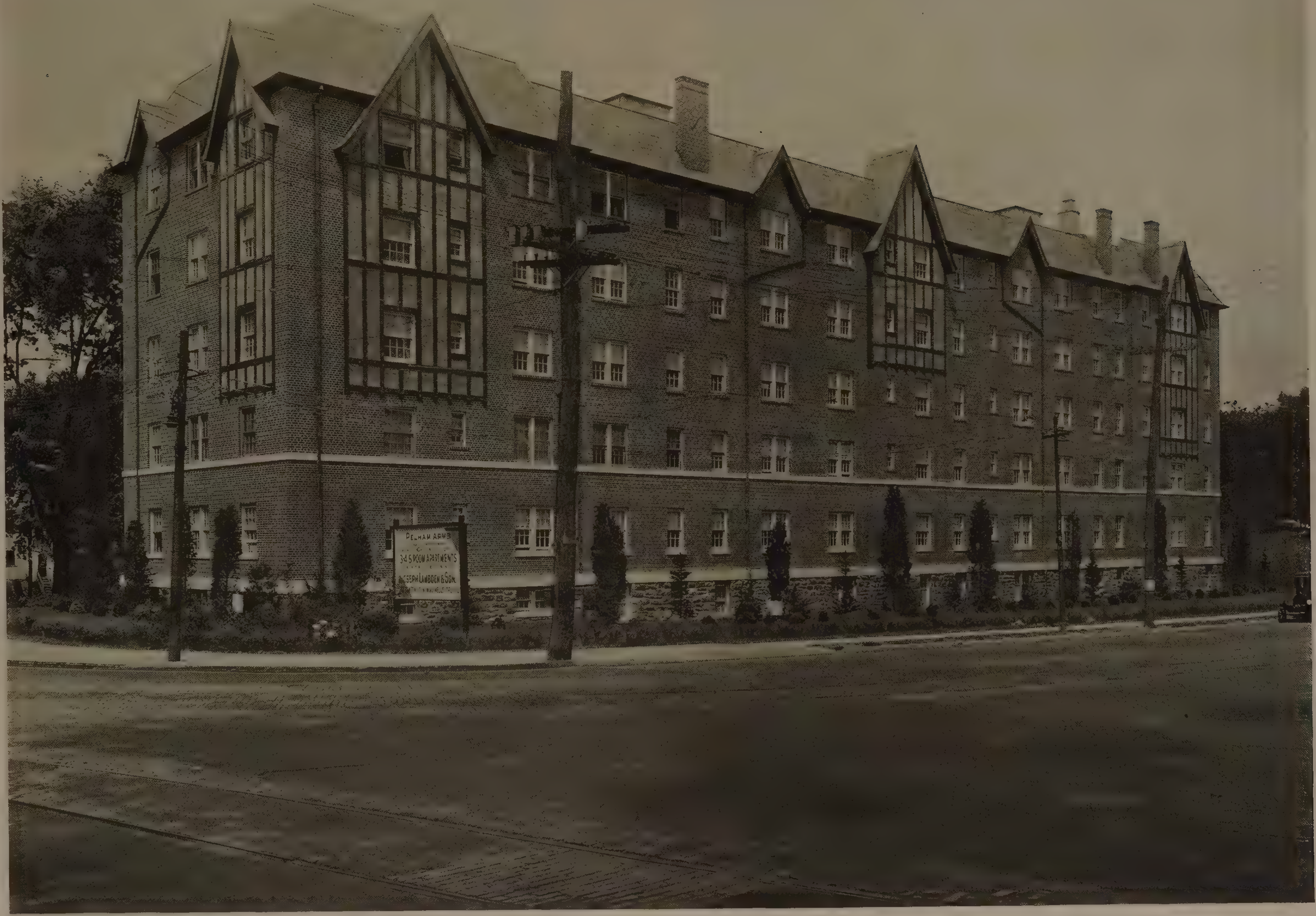
Design for co-operative apartments, 35 West 9th Street, New York.



DESCRIPTION OF PROPOSED BUILDING

The building is a fireproof structure, nine stories in height. It contains thirty-six typical apartments, four apartments on each floor, one of five rooms and two baths, two of four rooms and one bath, and one of three rooms and one bath. The façade will be carried out in a modified Adam style of architecture with lower stories of variegated Indiana limestone and ornamented cast-stone, upper stories of rough texture red brick. The entire exterior will have the air of quiet dignity and charm of the old New York houses of that period. All living-rooms have open wood-burning fireplaces. Master baths are equipped with the latest fixtures and shower. All kitchens are provided with dressers, range, icebox, combination sink and washtub, and linoleum for the floor. The building will be ready for occupancy September, 1926, and is "100 per cent co-operative ownership."

CO-OPERATIVE APARTMENT-HOUSES OF THE SMALLER TYPE.

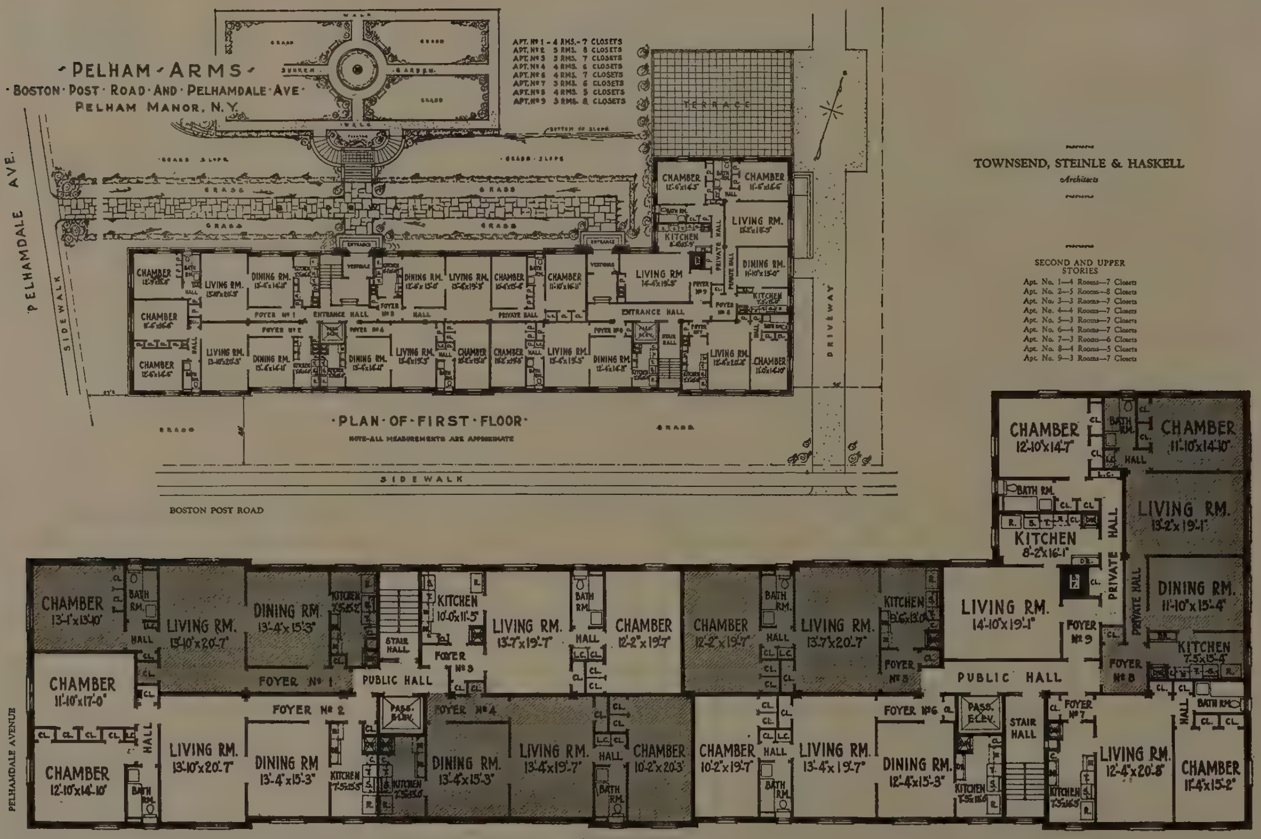


Street façade, Pelham Arms Apartments, Pelham Manor, N. Y.

Townsend, Steinle & Haskell, Architects.

CO-OPERATIVE APARTMENT-HOUSES OF THE SMALLER TYPE.

From the garden.



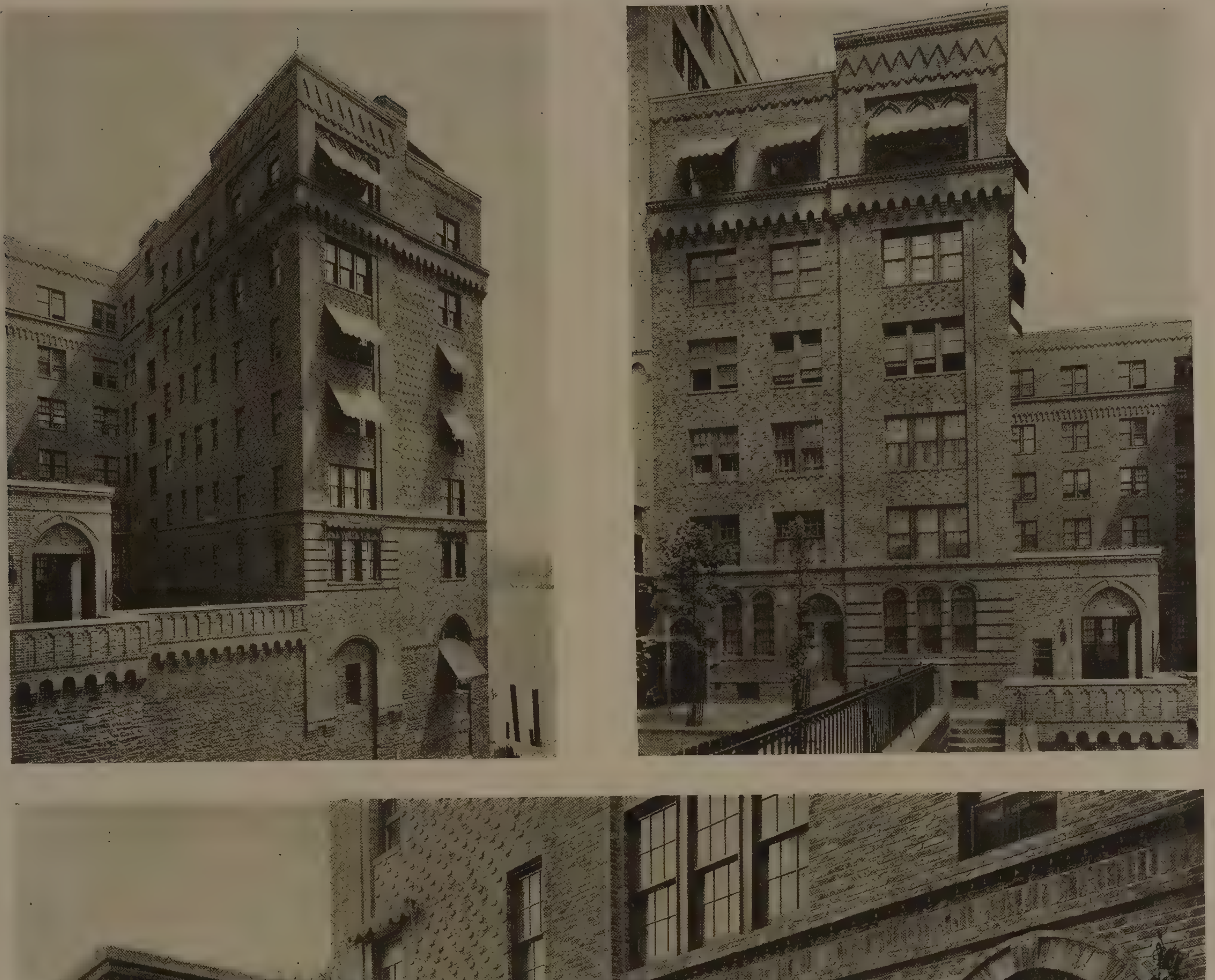
TOWNSEND, STEINLE & HASKELL
Architects

SECOND AND UPPER STORIES
Apt. No. 1—4 Rooms—7 Closets
Apt. No. 2—5 Rooms—8 Closets
Apt. No. 3—3 Rooms—7 Closets
Apt. No. 4—4 Rooms—7 Closets
Apt. No. 5—3 Rooms—7 Closets
Apt. No. 6—4 Rooms—7 Closets
Apt. No. 7—3 Rooms—6 Closets
Apt. No. 8—4 Rooms—5 Closets
Apt. No. 9—3 Rooms—7 Closets

OF TYPICAL FLOOR

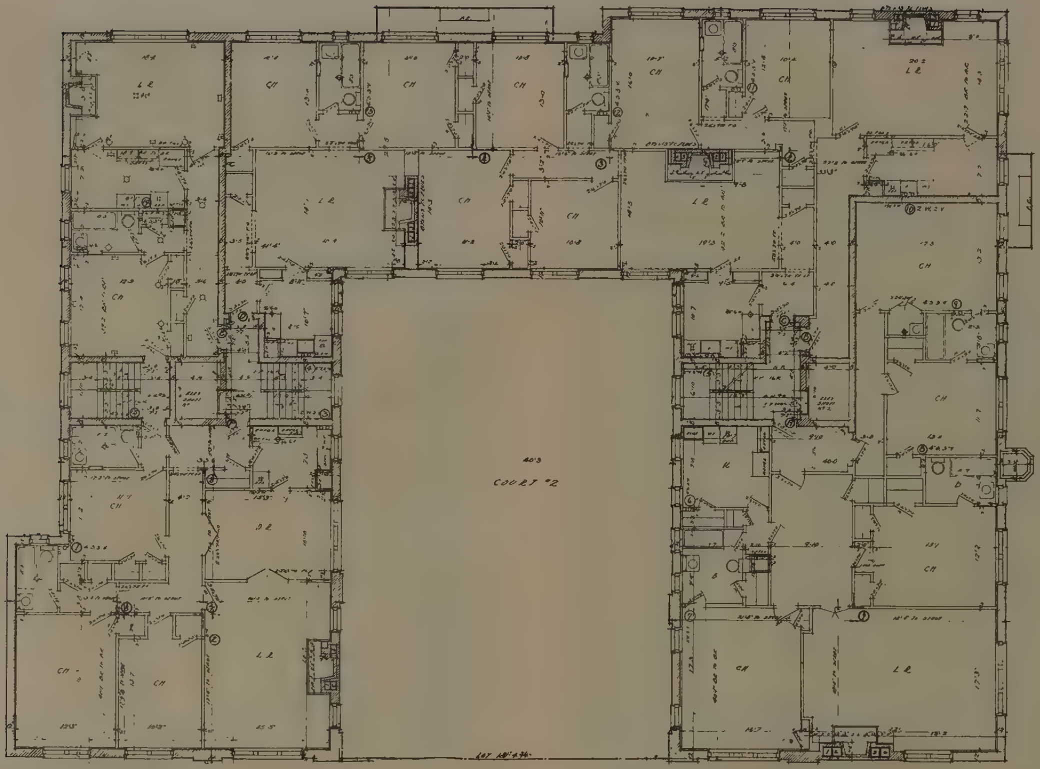
Pelham Arms Apartments, Pelham Manor, N. Y. Townsend, Steinle & Haskell, Architects.

CO-OPERATIVE APARTMENT-HOUSES OF THE SMALLER TYPE.

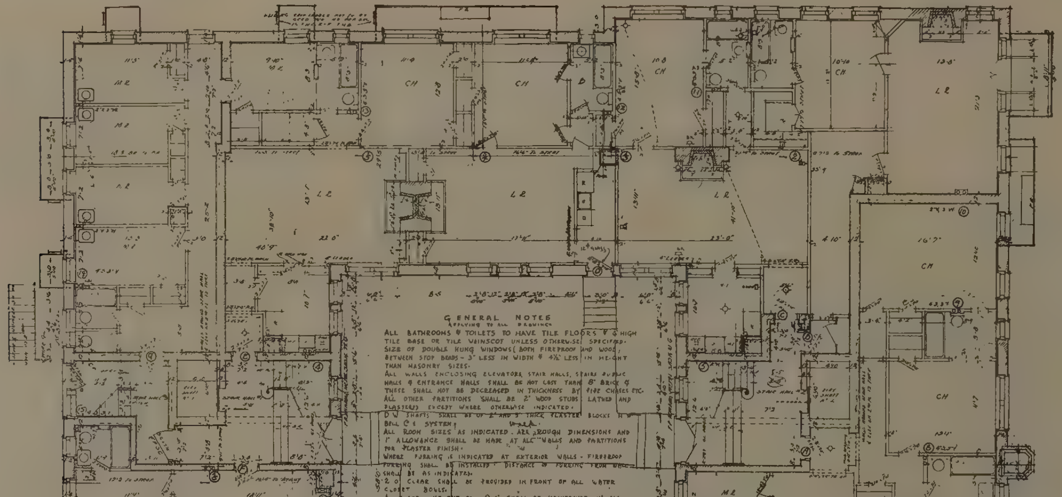


Beekman Terrace Apartments, New York. Treanor & Fatio, Architects.

CO–OPERATIVE APARTMENT–HOUSES OF THE SMALLER TYPE.

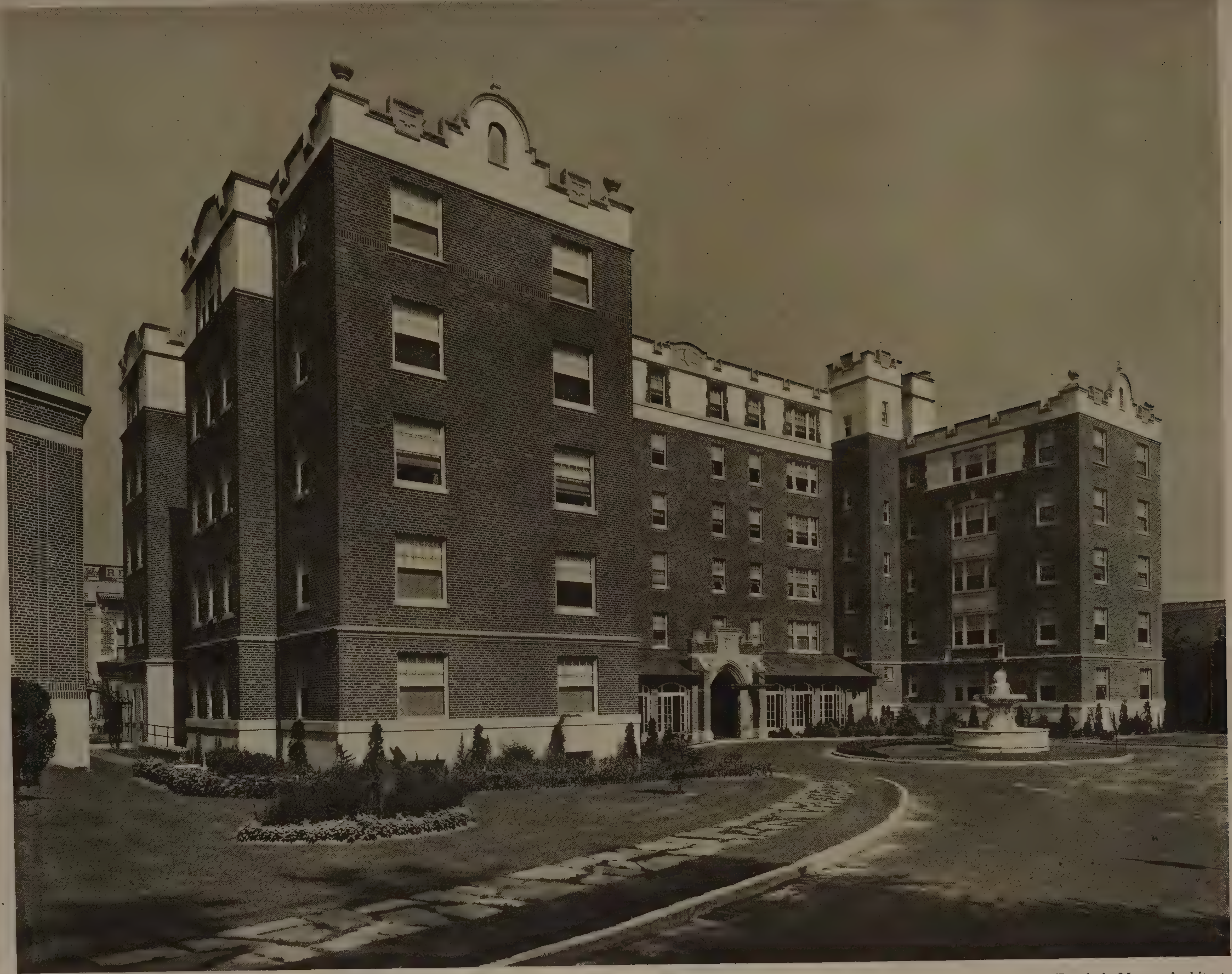


Typical floor plan.


GENERAL NOTES
APPLYING TO ALL DRAWINGS
ALL BATHROOMS & TOILETS TO HAVE TILE FLOORS & 6" HIGH TILE BASE OR TILE WAINSCOT UNLESS OTHERWISE SPECIFIED.
SIZE OF DOUBLE HUNG WINDOWS (BOTH FIREPROOF AND WOOD) BETWEEN STOP BEADS - 3" LESS IN WIDTH & 4½" LESS IN HEIGHT THAN MASONRY SIZES.
ALL WALLS ENCLOSING ELEVATORS, STAIR HALLS, STAIRS, PUBLIC HALLS & ENTRANCE HALLS SHALL BE NOT LESS THAN 8" BRICK & THESE SHALL NOT BE DECREASED IN THICKNESS BY PIPE CHASES ETC.
ALL OTHER PARTITIONS SHALL BE 2" WOOD STUDS LATHED AND PLASTERED EXCEPT WHERE OTHERWISE INDICATED.
D W SHAFTS SHALL BE OF 2" AND 3" THICK PLASTER BLOCKS H W BELL C I SYSTEM.
ALL ROOM SIZES AS INDICATED ARE ROUGH DIMENSIONS AND 1" ALLOWANCE SHALL BE MADE AT ALL WALLS AND PARTITIONS FOR PLASTER FINISH.
WHERE FURRING IS INDICATED AT EXTERIOR WALLS - FIREPROOF FURRING SHALL BE INSTALLED. DISTANCE OF FURRING FROM WALL SHALL BE AS INDICATED.
2'-0" CLEAR SHALL BE PROVIDED IN FRONT OF ALL WATER CLOSET BOWLS.
A CLEAR HEIGHT OF 9'-0" SHALL BE MAINTAINED IN ALL LIVING ROOMS WITHIN THE LEGAL AREA PRESCRIBED BY THE TENEMENT HOUSE LAW
STAIR RISERS SHALL NOT BE MORE THAN 8" HIGH - TREADS SHALL NOT BE LESS THAN 10" WIDE - STAIR SHALL BE 3'-0" WIDE IN THE CLEAR AT ALL PARTS
ALL ELEVATOR DOORS SHALL BE PROVIDED WITH DOOR CONTACTS
COURT #2
Walk
Garden
WAITING ROOM
ENTRANCE PLATFORM
FIRE PASSAGE
L.R
CH
M.R
D
FIRST-FLOOR-PLAN.
SCALE ⅛"=1'-0"

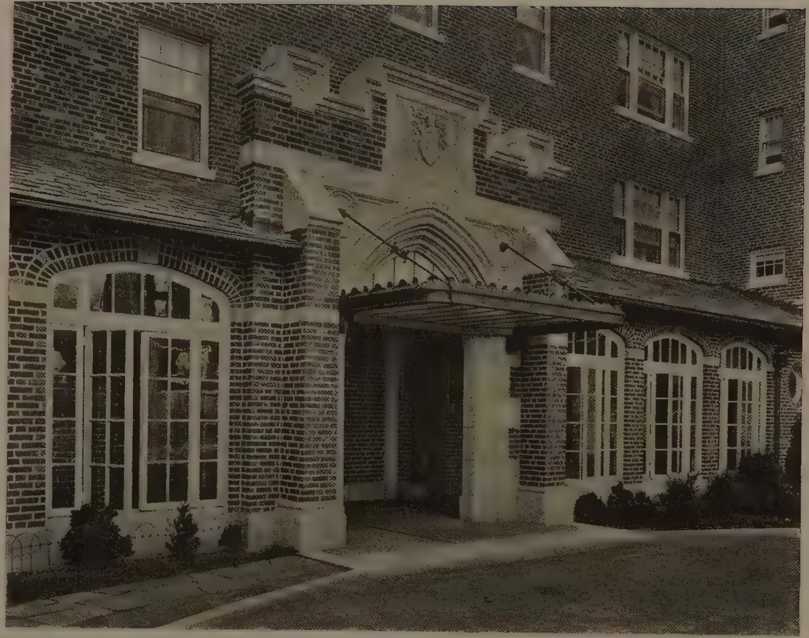
Beekman Terrace Apartments, New York. Treanor & Fatio, Architects.

CO-OPERATIVE APARTMENT-HOUSES OF THE SMALLER TYPE

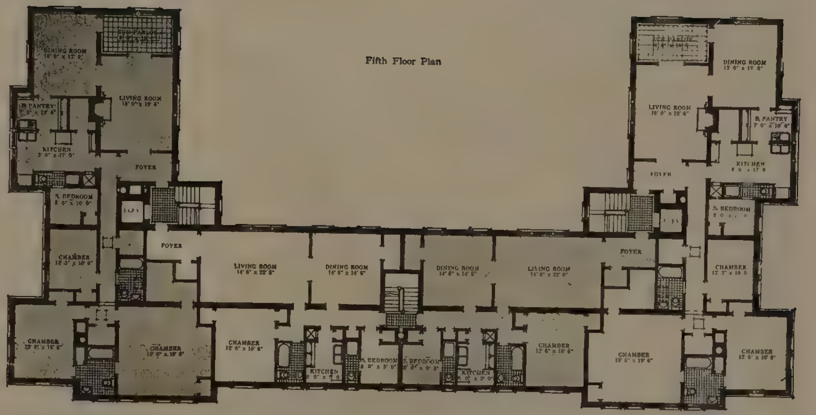


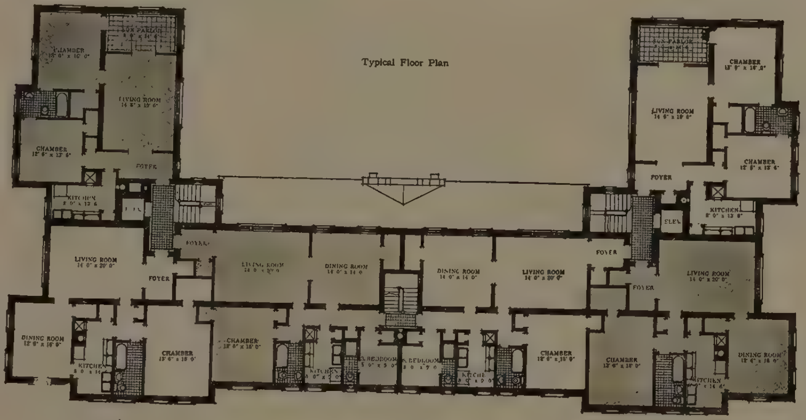
Albee Court, Larchmont, N. Y. Frank A. Moore, Architect.

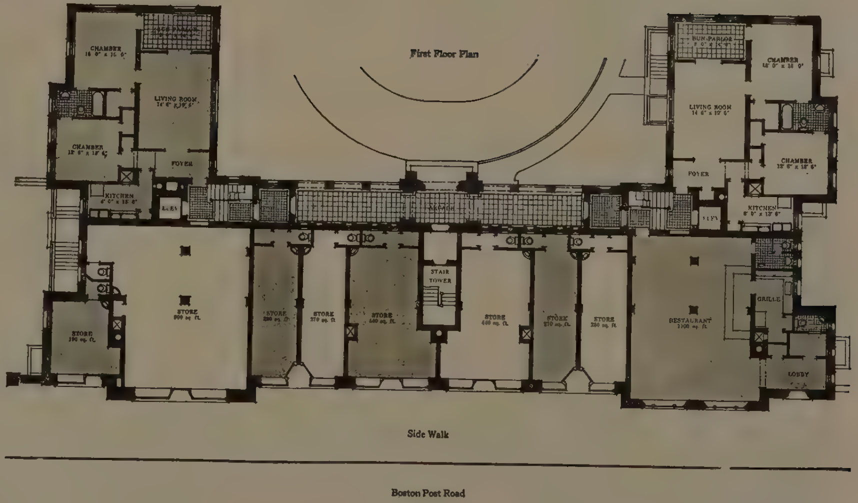
CO-OPERATIVE APARTMENT-HOUSES OF THE SMALLER TYPE.



Entrance detail.



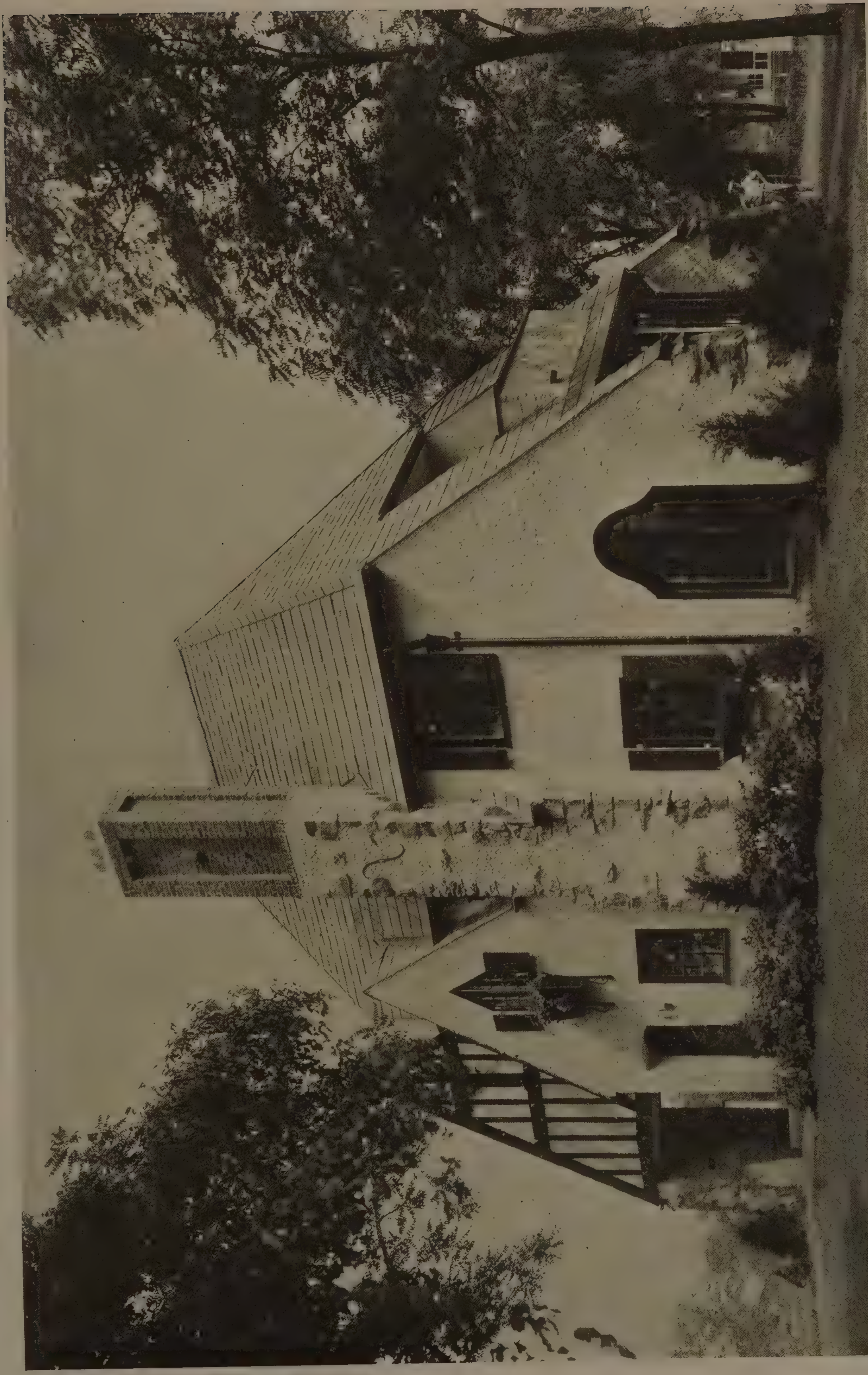




Albee Court Apartments, Larchmont, N. Y.

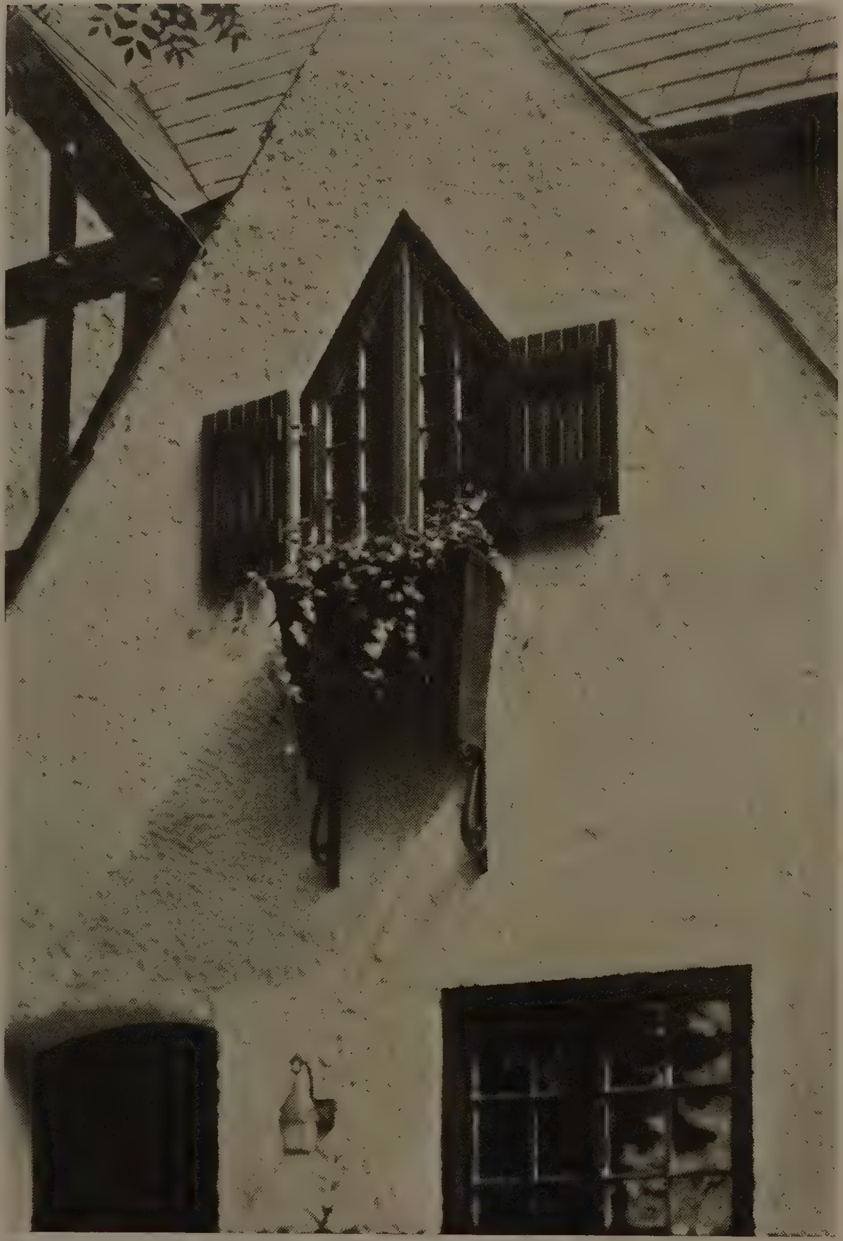
Frank A. Moore, Architect.

CO-OPERATIVE APARTMENT-HOUSES OF THE SMALLER TYPE.

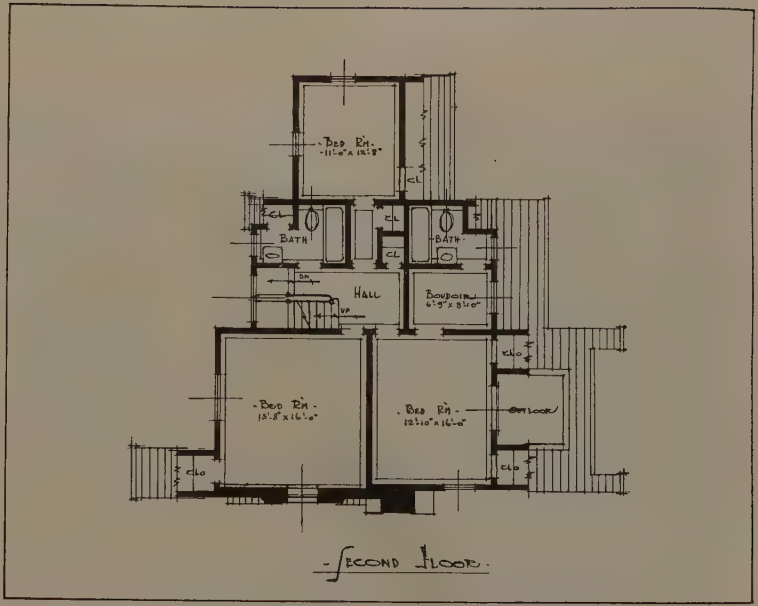


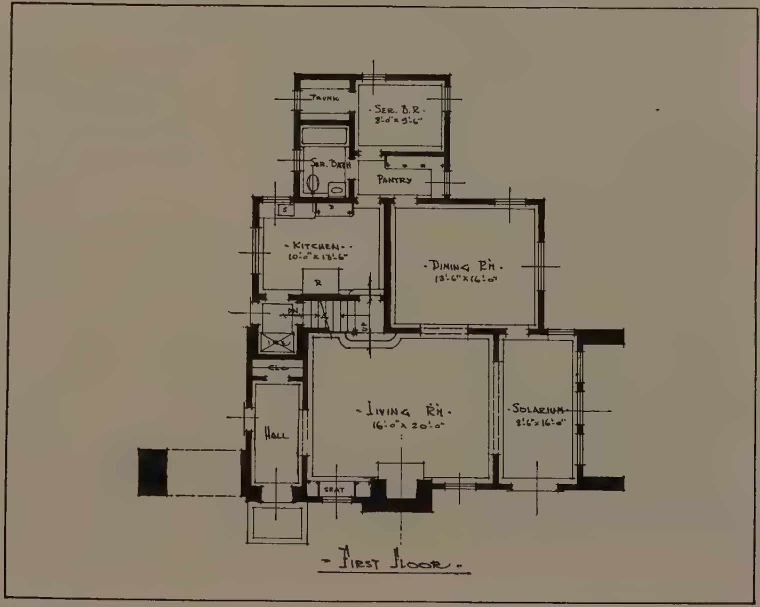
HOUSE, GENE SARAZEN, BRONXVILLE, N. Y.

D. A. Summo, Architect.



DETAIL, HOUSE, GENE SARAZEN, BRONXVILLE, N. Y.





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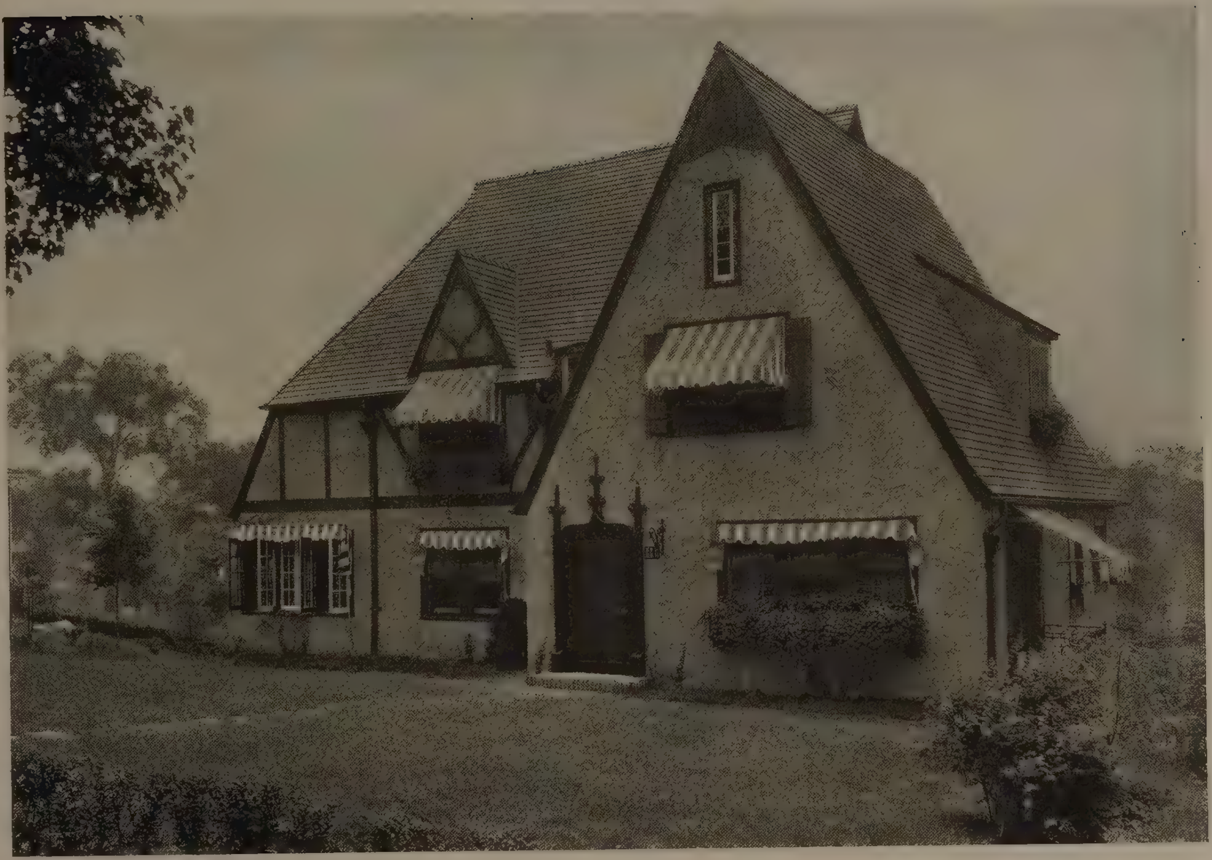
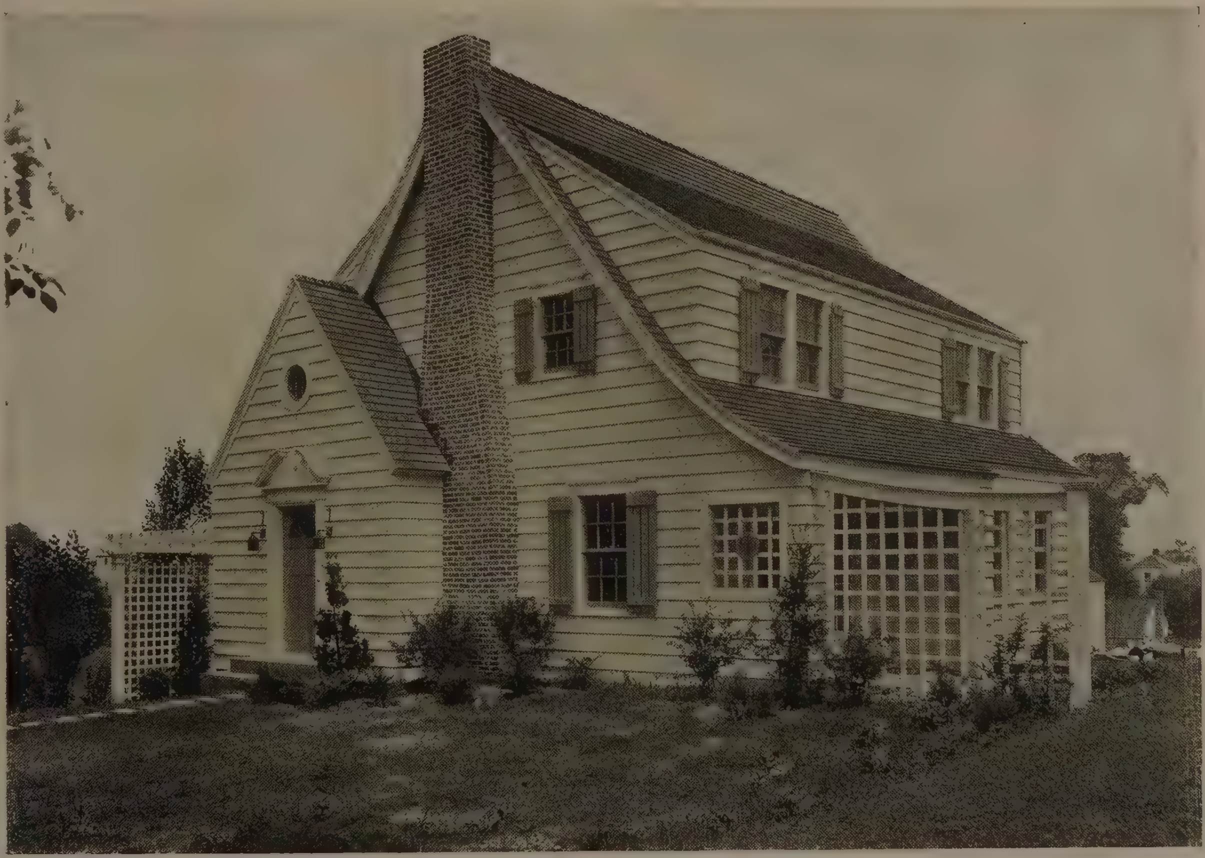
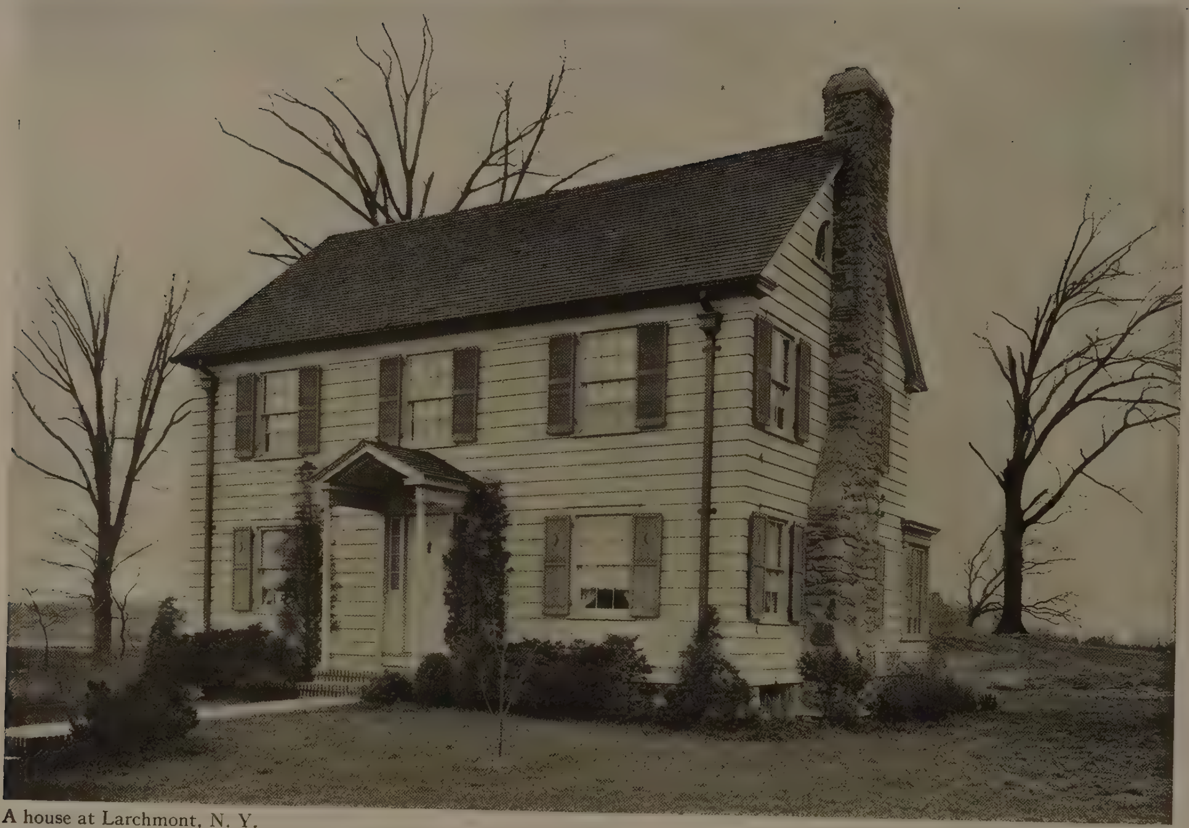


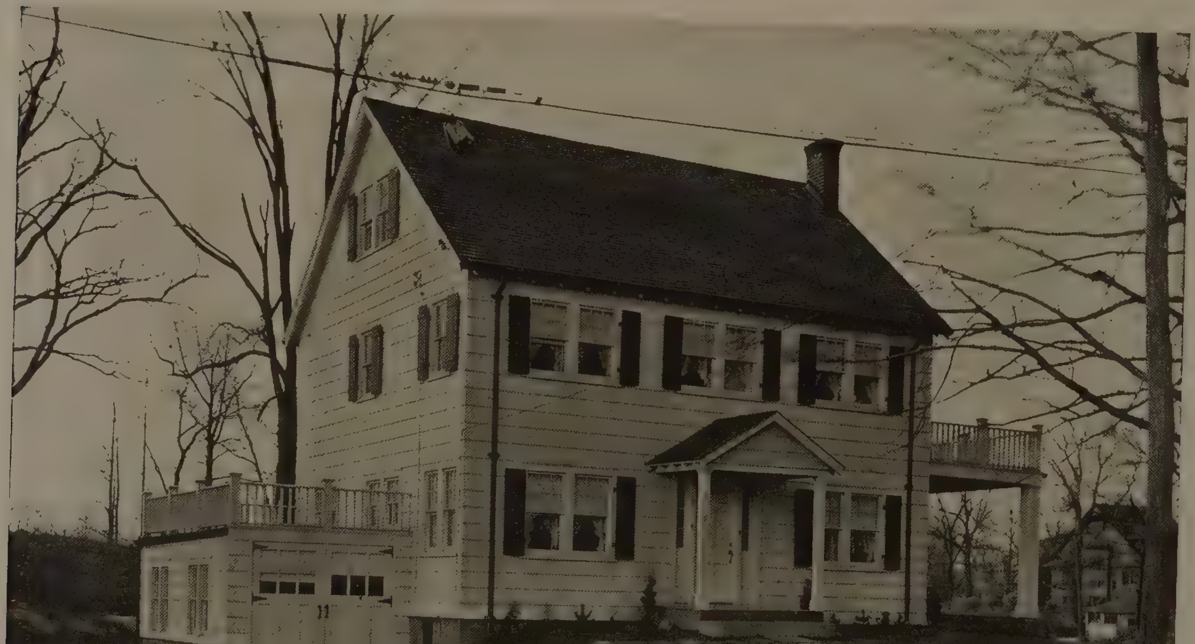
A house at Stamford, Conn.



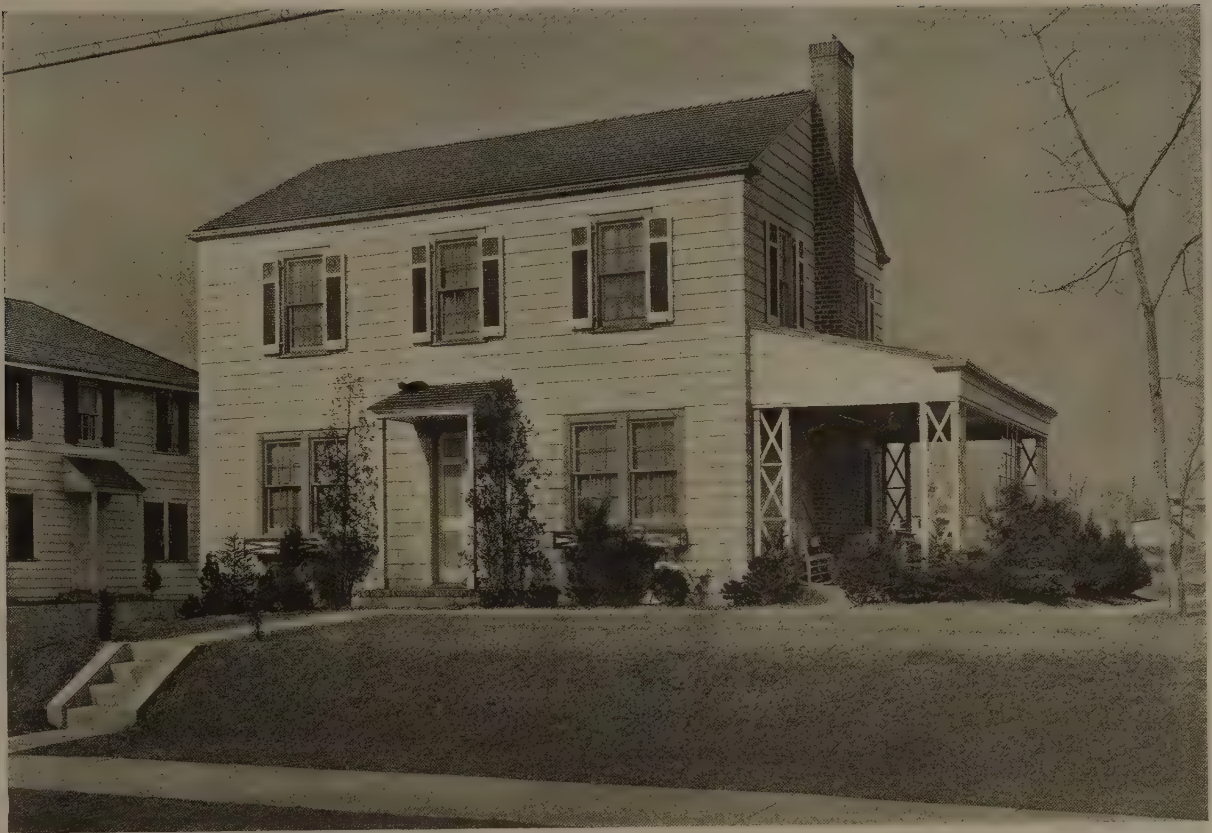
A house at Stamford, Conn.

SMALL HOUSES IN SUBURBAN TOWNS.

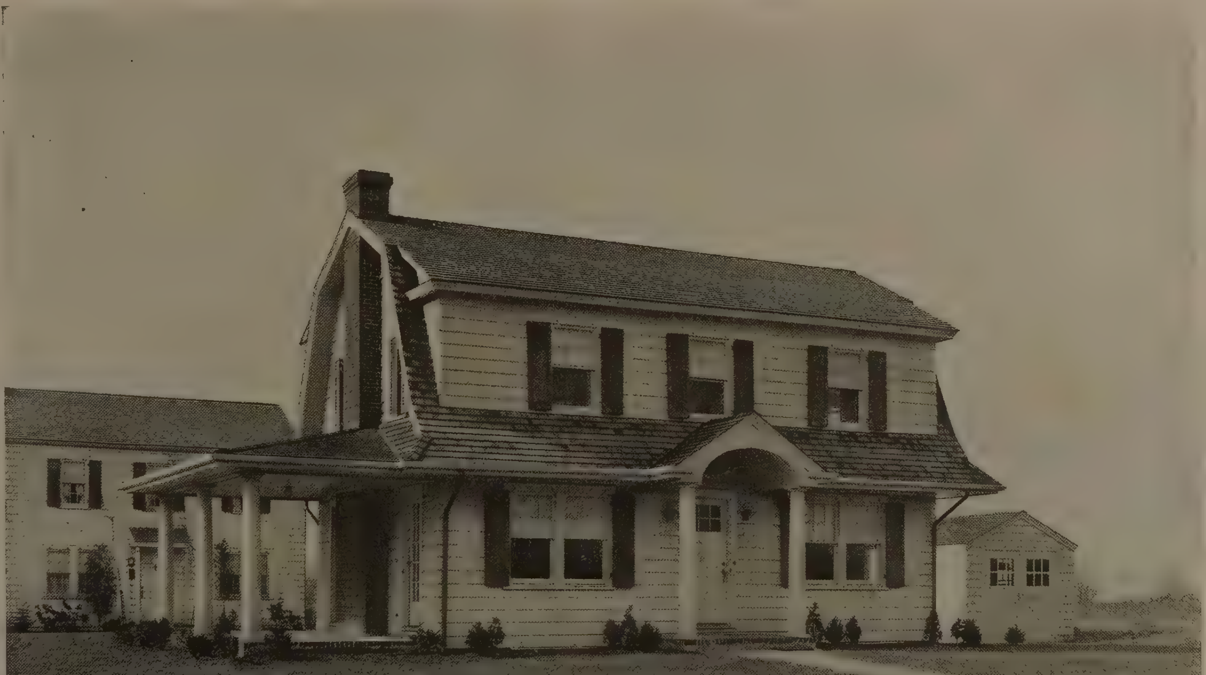

A house at Larchmont, N. Y.


A house at Larchmont, N. Y.

SMALL HOUSES IN SUBURBAN TOWNS.

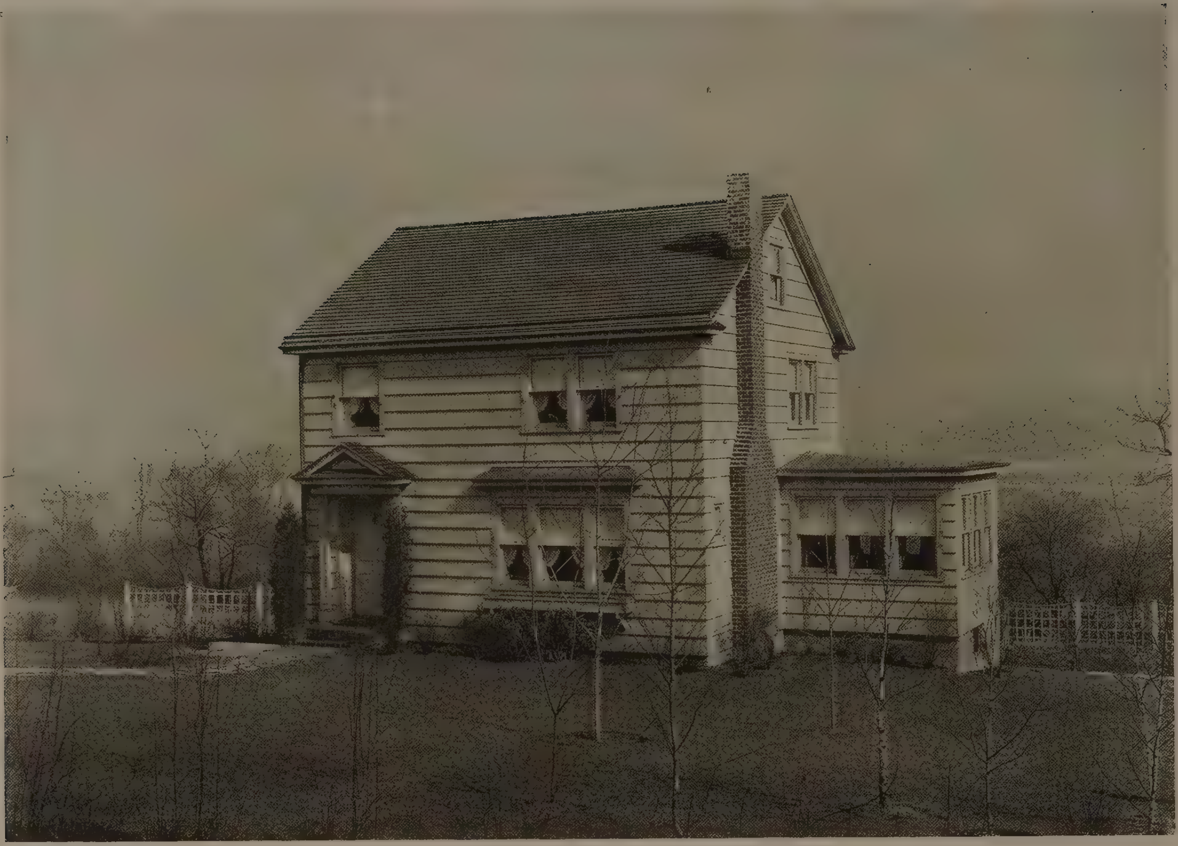


A house at Phelps Manor, N. J.

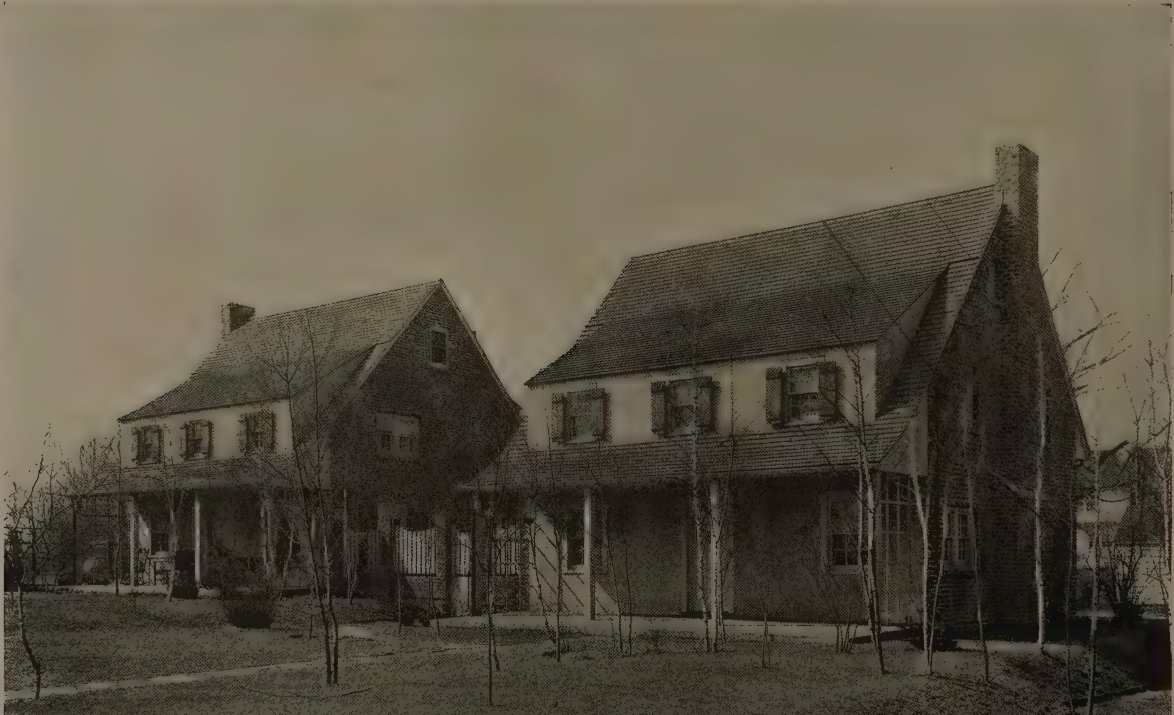


A house at Phelps Manor, N. J.

SMALL HOUSES IN SUBURBAN TOWNS.



A house at Teaneck, N. J.



Houses at Teaneck, N. J.

SMALL HOUSES IN SUBURBAN TOWNS.

Book Reviews

BERTRAM GROSVENOR GOODHUE—ARCHITECT AND MASTER OF MANY ARTS. The Text by Hartley Burr Alexander, Ralph Adams Cram, George Ellery Hale, Lee Lawrie, C. Howard Walker, Charles Harris Whitaker. Edited by Charles Harris Whitaker. Press of the American Institute of Architects, Inc., New York City.

SLEEPE·AFTER·TOILE·PORTE·AFTER
STORMIE·SEAS·EASE·AFTER·WARRE
DEATH·AFTER·LIFE·DOTH·GREATLIE·PLEASE

In looking through this beautiful book we cannot but feel that Mr. Goodhue would have found pleasure in it merely as a specimen of one of the arts in which he was always deeply interested. It has been compiled with a regard for the things that best manifested his many-sided genius, and with a loving care only possible in those who knew him and the great place he held in his chosen profession. Some day, maybe, we shall have a more definitive and inclusive biography, but for the present this volume covers all essentials, and in text and illustrations expresses both the personality and the art of the man.

In Mr. Whitaker's introductory biographical sketch he tells us that Mr. Goodhue was born in Pomfret, Conn. "His family history flows along with the history of Pomfret without a break, and its members had much to do with its affairs." He was born in 1869. "Those who remember Bertram Goodhue in boyhood recall his love for the woods, which were then distributed in such splendor over the magnificent hills that there abound. To angling he took with a fervor that never left him, but long days spent in the woods at all seasons found him with a pad and pencil, and his especial fondness, as Mr. Hoppin, one of his boyhood companions on these excursions, recalls, was the long contemplation of the trees, slim-standing in their tapestry of light and shadow, and with their arched and foliaged splendor meeting high above."

A dreamer and a lover of the beautiful with a natural talent for drawing and a sense of the pictorial. Of schooling in the conventional ways he had but little, but better than any teaching was his avid search in books of all kinds for the things that gratified his spiritual needs, and taught him the things that he needed toward directing his mind along the ways of the profession he had declared he would follow. The two years he spent at the Russell Collegiate Institute in New Haven were largely spent "in drawing dream cities or in caricaturing his fellow students." Happy and fortunate boy to be permitted to grow within himself. "His impressionable mind had no need of what is called education in the school sense, and it is very likely that his true genius took seed and blossomed and bore a fruit that might have been less to the taste had that genius been interfered with by pedantry or academicism."

Always a student, "his mastery of the arts was not merely the manifestation of a divine gift that flowed on without effort. He sought and studied, read and remembered, and there is no piece of his work, in any field, that is not imbued with as much knowledge as skill."

His first experience in an architect's office was with Renwick, Aspinwall & Tucker, in New York, a firm still in existence. Here he made an immediate impression, and in a few years he was widely known as a designer of unusual distinction. "He was an extraordinarily hard-working young draftsman."

The story of his going to Boston, later to become a partner in the firm of Cram, Goodhue & Ferguson, is told in an article by Mr. Cram:

"No more engaging youth could have put in an appearance. Blond, slender, debonair, with a 'school-girl complexion,' and a native grace of carriage, he presented a personality made up of joy of life, fantastic humor, whimsical fads and fancies, blended with a dominating ambition, an incomparable sense of beauty, an abounding friendliness, and a capacity for hard work that nothing could daunt. Already, though he had hardly more than attained his majority, he revealed an incomparable sense of ornament and architectural detail, while in some way or other he had made himself a not unworthy rival of Raffles Davidson in pen-and-ink rendering. With it all were a naiveté and a boyishness that were lasting joys."

Of Mr. Goodhue's place in his profession, Mr. Cram says:

"Not only was Bertram Goodhue a very great genius in his own right as a creative artist, he was also a dynamic source of immense inspiration. His personality was such that it drew out of all with whom he came in contact all that was potential in them, and even seemed to instil into each one something that was not there before. This was true of his associates, whether partners or draftsmen, and of those kindred spirits outside architecture of whom I have spoken. Nor was this in the least a conscious action on his part. No one was ever less a propagandist or wilful educator; this sort of thing he looked on rather with disdain. Yet—he remains one of the great educational agencies in American architecture, for I suppose there are more successful practitioners to-day who owe their inspiration to him than hold in the case of almost any other American architect, except one or two of his immediate predecessors. What he was and what he accomplished are a lasting testimony to the creative force of personality, for in the end it comes down to this, that in a day of low averages here was a personal quality and force that stood out clear, definite, and brilliant, with but few peers in his own day and generation."

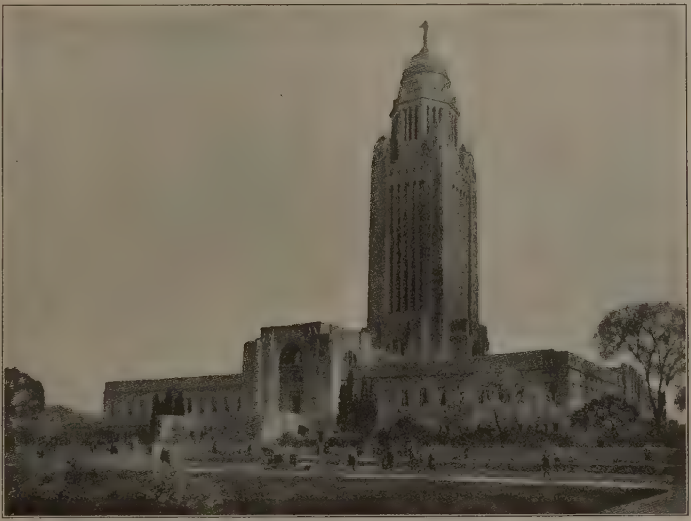
C. Howard Walker says: "His genius was Protean; it took many forms and it graced them all."

How true is the following as applied to the author's own work. It is an extract from comments written by Mr. Goodhue, and quoted in Mr. Whitaker's sketch:

"But, after all, Mediæval Gothic, the Gothic of the cathedrals to which I have referred, and Modern Gothic, the Gothic of such churches as are being built now all over England and America, are two very distinct things. Mediæval Gothic is now impossible and must remain mediæval, and the Gothic we do to-day, if it is to be vital, and beautiful, and true, and good, and therefore Art, must be of our own times. I don't mean by this that we must abandon all the old ideals or any of the old materials. Steel-framing and reinforced concrete are good enough things in their way when properly used as the servants of the architect, but just because we have such materials is no reason why we should throw away stone, and oak, and carving, and metal work, and stained glass. We may not actually imitate the masterpieces of old; we would have to be of the times that created them to do that, but we may retain all that we worthily can of their underlying spirit. . . ."

If the impressions of the various contributors to the volume help us to better understand the man, to realize the charm and inspiring character of his personality, a glance through the numerous plates manifests his many-sided interests in the arts, and reveals his genius as it broadened and developed beyond any merely academic limits into such a vital outstanding and daring achievement as the Nebraska State Capitol. Mr. Alexander says of this:

"It is beyond question that there is a powerful element of free imagination in this Goodhue conception, and that herein lies the secret of its vitality. The very fact that the designer entered the competition only with some persuasion and with little expectation of success, and that he approached "the Nebraska thing"—as he playfully called it—with a certain unconcern, this attitude in itself gave him conscious emancipation. Beyond this lay the unlimited nature of the field: a checker-board town in a section-line country, virtually flat, which, if they were to be adorned at all, must be adorned by the hand of man; a public with no architectural prepossessions; a client who could but accept or decline without suggestion; a theme that in its nature called for outward majesty. It was an ideal opportunity for imaginative daring, and it was seized upon."



Nebraska State Capitol, Lincoln, Neb.

Doctor Hale refers to Mr. Goodhue as a romanticist:

"I must add that I find a still stronger appeal in Goodhue the romanticist. One of his former associates, in the introduction to 'A Book of Architectural and Decorative Drawings by Bertram Grosvenor Goodhue,' truly describes him as 'a favored child of all the arts.' The range of his imagination carried him into so many territories that the present volume cannot begin to exhibit the spoil he brought home. Best and most characteristic of this booty is that captured from the castles and towns of his 'voyages imaginaires.'"

The Effect of Gravity on Building Construction

By H. Vandervoort Walsh

Professor of Construction, School of Architecture, Columbia University

Article II

THE REVERENCE OF OUR ANCESTORS FOR THE GREAT AND HEAVY STONE

The Temple of Karnak, in Egypt, showing the use of enormous stones, but very simple construction.

THERE is a living record of the way the ancient builders considered the action of gravity on the various units of their structure. We find it in the derivation of such words as weight, load, and force. Weight came from an Anglo-Saxon word meaning to lift, load from another word meaning to carry, and force from the Latin root *fortia* meaning muscular vigor and strength for combat. These words show that our ancestors did not make mental pictures of that invisible thing which we call the force of gravity, but that they thought only of the resistance of structural members to their physical efforts to move them. They were well aware of the muscular strength needed to raise building-stones to their place in the wall, but they did not ask questions how and why this was so. They appreciated the fact that the bigger the stone was, the more strength was required to raise it, and that some were so big that it took many men, and others were too big to be lifted at all.

This silent resistance of stones to the physical effort of man to move them made a deep mental impression on all of the oldest builders. They learned to respect big stones, for these hard blocks were stronger than they were. They credited them with animate powers of resistance. Walls constructed of them seemed to be mightier walls than those built of smaller ones. Gigantic statues, carved from one great stone, were very awe-inspiring to them. Monolithic columns and tall obelisks were held in reverence.

Now, all of the remains of buildings erected by the earliest races were built to honor their gods and kings, and the architects desired, above all, to impress the people with the strength of these mighty ones. Accordingly they built with great stones. If thousands of bleeding and sweating slaves were required to raise the huge blocks of marble or granite up into a building, that indicated the great power of the king who could command such human strength to overcome the sleeping giants in these stones. The same impression of awe is felt, even by us to-day, when we see their monuments. The great size and apparent permanence appeal to our sense of weight and power. We all have a sneaking belief that a race of giants once stalked the face of the earth, and perhaps these monuments were built by their hands. And that was the impression these old builders desired to give, for they wanted their gods and kings to be pictured as supermen. Thus, even in the carved pictures of the kings, appearing before their conquered enemies, they are shown to be two and three times larger than the captives who bow before them.

Wherever we go, throughout the world, the oldest races and civilizations have left us evidence of their love of great stones, which after all was reverence of their weight. In Cuzco, the capital city of the Inca empire and the oldest living city of South America (indeed, it can lay claim to being one of the oldest cities in the world), there are walls of extraordinary masonry, which show the work of three epochs. The oldest and lowest strata is built with huge polygonal stones cut and shaped to fit together like a cut-out puzzle, and laid with extreme care and accuracy. The strata above is built of squared stones of somewhat smaller size but still very big, and the top layer is but the flimsiest work of modern dwellings.

Stonehenge in the County of Wiltshire, England, built by prehistoric man.

Then there are the strange giant stones (one 67 feet high before it fell) of the megalithic builders of four thousand years ago near the village of Carnac in Brittany. Uncut and shaped as by Nature, they stand in long lines, the cause of much guessing concerning their original purpose. But certain we are that they were monuments of some kind, and they are evidence of man's primitive reverence for the great stone.

Likewise, there is the famous Stonehenge in the county of Wiltshire, England, where thirty enormous upright stones were placed by prehistoric man in a circle 100 feet in diameter and were capped by great lintel stones. In repairing the ruins, one of the lintel stones had to be moved, which required blocks, tackle, and derrick. If in modern times so much machinery was needed to move them, how tremendous a job it must have been for the original builders. There must have been a feeling of exhilaration in overcoming their weight, for even to-day the ponderous size of the stones stirs a responsive chord in the heart of the observer.

Other examples of megalithic monuments have been unearthed by archæologists on the gray island of Malta. A dozen or so temples built in the most primitive fashion have been found. But, although the plans and forms are crude, the builders have raised great stones for the supports and the lintels.

The abandoned stone in a quarry a half mile from the Temple of Bacchus at Baalbek.

Of course Egypt is full of buildings erected with great blocks of granite and sandstone. Tall obelisks 70 and 80 feet high, mammoth statues like those of Rameses II at the entrance of the great temple of Abu-Simbel, massive stone columns like those in the great hall of the temple of Karnak—all of these and many more are mute reminders of man's respect for the great stone that requires the combined physical effort of hundreds of men to move.

Then the Roman builders have left the same record. In the walls of the Acropolis at Baalbek are some of the largest stones ever moved by man. They are 64 feet long, 13 feet high, and 10 feet thick. In a quarry a half-mile away lies a stone even larger than these, as though it had been abandoned, its great weight having defeated the skill and strength of the builders. The great marble columns of the temple of Bacchus on the same site were brought from the interior of Egypt, a journey that must have required at least three years and untold suffering and toil.

Why did our ancestors struggle with such great stones when they could have built with smaller ones? Because they had a tremendous sense of the power of resistance of great monoliths, and this sense struck awe into their hearts when they saw a monument built of them, and as they were building for their mighty ones they constructed in the mightiest way they knew. Their buildings were monuments of sacrifice of human toil, blood, and death offered up in the memory of their kings and to honor their gods.

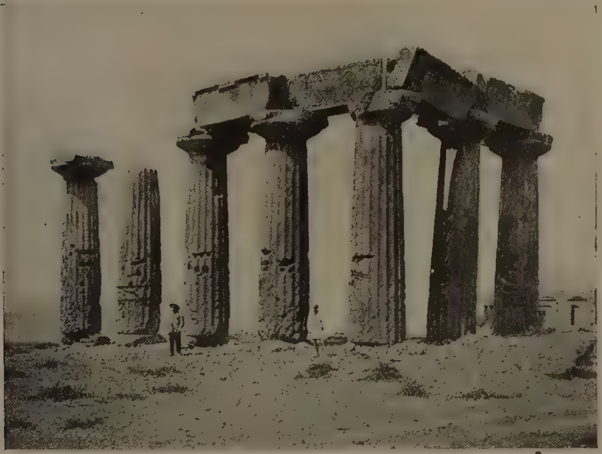
They knew the force of gravity in terms, not of weight and pounds, but in terms of aching backs, broken legs, and arms, crushed ribs, bleeding hands, and exhausted muscles.

But gradually machines were developed to move great weights, and practical builders grew less respectful of the large stones. The same glory in lifting them was no longer theirs, and so they began to count the cost. Little by little they cut off a part here and there of a column or a lintel, and found that the smaller sizes were strong enough for the work. Thus when they were better able to use the big building units, they lost their interest in them, and began to turn their attention to other matters. We to-day can appreciate that point of view, for we have engines and machines for lifting blocks of stone so big that our ancestors would have gasped in wonder, and yet we do not build with them; for since we are able to do it there is no marvel in it for us. We look at construction in a matter-of-fact way, counting the cost, and decide that small units are cheaper to build with. Nor are we laboring under the illusion which spurred on our fathers, that we must build for eternity, because we have the ruins of too many cities to teach us the futility of it.

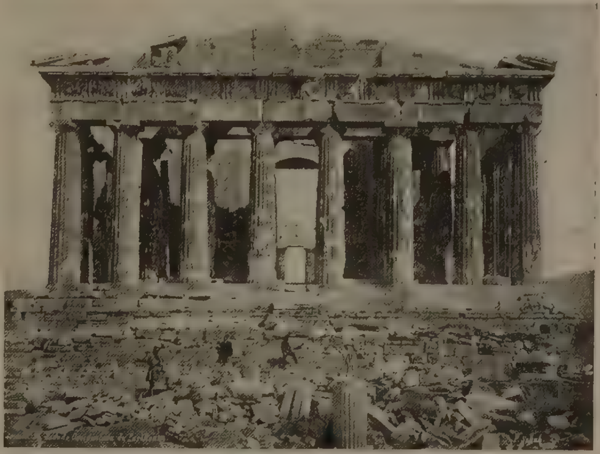
The historical classification of architecture shows this trend of feeling. The early Greek temples were massive and heavy as compared with the later ones, which were delicate and refined. Compared with the older Egyptian temples, they seem almost to be fragile. But the interest of the Greek architect was centred not upon size but upon beauty and fine proportion. These were intellectual matters and did not appeal to the physical prowess of man.

Another trend of the builder's mind was his growing interest in the balancing of his building-blocks, so he took delight in making the very force that caused his blocks to fall serve to hold up the building. The simple arch and vault was his beginning. Through long years of experience and failures builders became so expert in the art of juggling blocks that the cathedrals of the Middle Ages became a reality. These great churches were the antipodes in construction of the old temples of Egypt. The cathedrals were built with small stones beautifully balanced across arches and vaults, whereas the Egyptian temples are built of heavy stones laid upon columns in the simplest possible way. The cathedrals suggest the directing control of the mind over the art of block-building, but the temples of Egypt suggest the mastery of the brute over great building-stones.

After all, the progress of the art of construction represents an increasing knowledge of that force we call gravity. The oldest builders respected it as something that resisted their physical strength, and so they gloried in overcoming it. They noticed that the bigger stones remained in position better than the little ones. They learned that when blocks were piled on top of each other to build a wall, the higher the wall was raised the easier it fell over, and they



The Temple of Apollo at Corinth. Note how much heavier are the stones than in the more refined Parthenon.



West end of Parthenon, at Athens. Compare the small size of stones with the big ones in the Egyptian Temple of Karnak.

The Temple of Kaffra, Egypt.

made similar observations while building towers and columns. Failures and repeated trials proved to them that they could build higher if they would slope the walls, towers, and columns inward at the top. Thus the very model of permanent construction was the Egyptian pyramid, with its great base and sloping sides. Likewise the walls of the temples and pylons were battered inward for strength. Columns, too, were made thinner at the top than the bottom.

This is but a recognition of that repose of all objects gripped in the hands of gravity, for the mountains and the hills have wider bases than tops. The drifts of the sands of the desert have their angle of repose. Man learns to spread his legs when he desires to be firm. The trunks of the sturdiest pine-trees are greater at the base than at the top. Indeed, all things in nature show us the law that if we desire to build high with building-blocks the base must grow in proportion to the height.

But as common and basic as was this observation, no one asked the question how it happened thus. The ancient builders accepted it without being curious concerning the reasons. They learned from experience that a building needed a base that was level and columns and walls that were vertical. The lakes and the ponds and their own sense of balance told them of the horizontal. Hanging ropes and vines and standing men told them of the vertical. They were satisfied with that. In their minds was no abstract conception of the force we call gravity, and which we will study in the light of modern knowledge in these articles.

Progress and Aims of the American Institute of Steel Construction

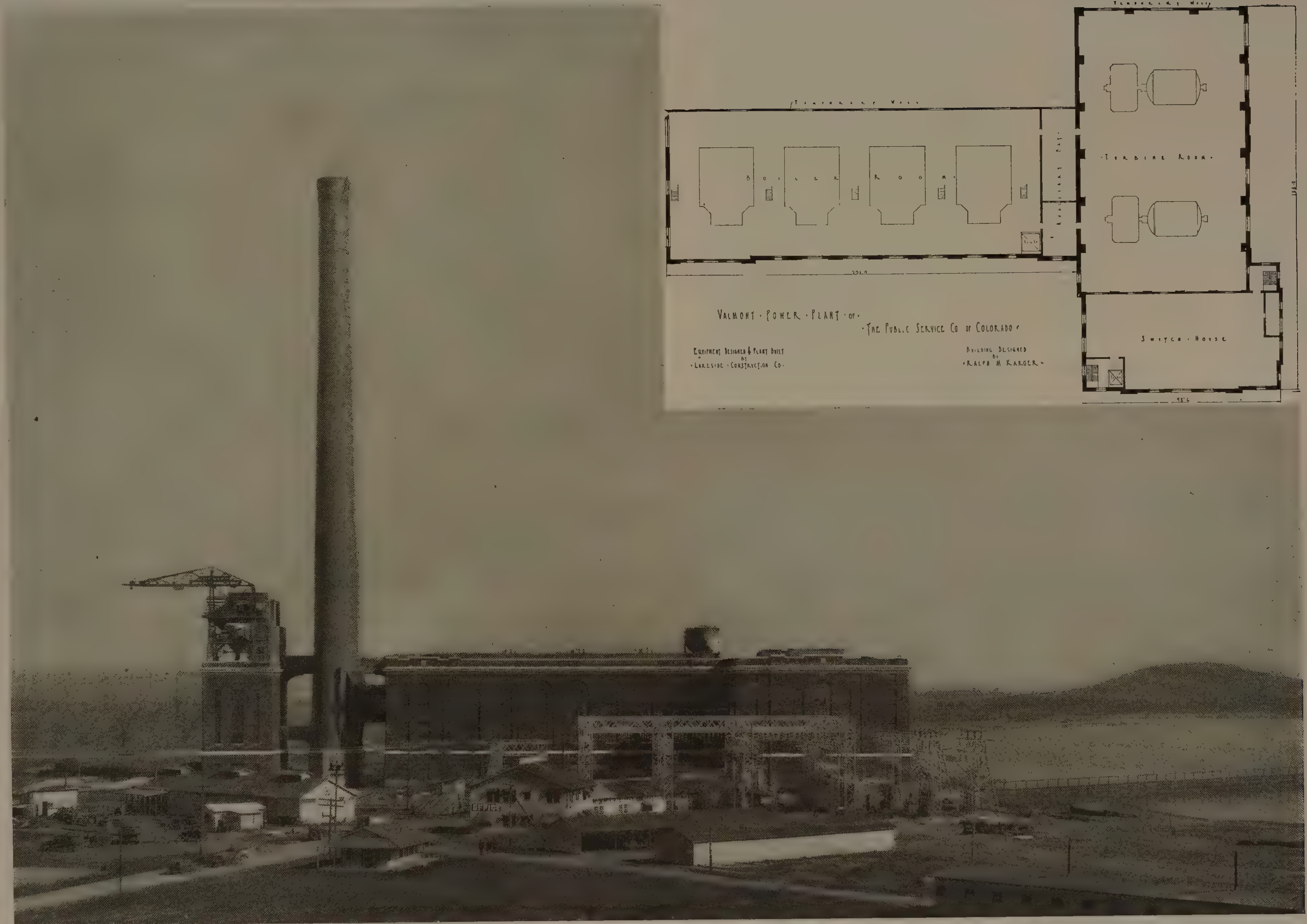
AT a recent meeting of the American Institute of Steel Construction, held in Boston, members of the building professions and others interested in the use of structural steel heard what the Institute has already accomplished, and what it hopes to accomplish as a result of its campaign to benefit both the fabricator and the public by securing the general adoption of its new standard specification of unit stress, and by the further introduction of construction economies, together with better business methods among the fabricators of structural steel.

The subject of the address of Mr. L. H. Miller, who is the chief engineer of the Institute, was the new standard specification of 18,000 pounds per square inch, which was developed by a committee of architects and engineers headed by Professor George F. Swain of Harvard University. "Since about 1885," said Mr. Miller, "when structural steel was first used as a building material, a working stress of 16,000 pounds has been prevalent in building construction. This figure has no authoritative basis. It was evolved from the rule-of-thumb methods, proportioned by safety factors based on ultimate strength; following the custom developed in the application of rational design to masonry and timber structures.

"Open-hearth steel, with its more uniform characteristics, has almost entirely supplanted the Bessemer steel used in structural shapes in the late '80's and early '90's. The quality of steel has steadily improved, but in many sections of the country the unit stress of 16,000 pounds is still incorporated in the building codes. However, due to the educational work of the Institute, some forty large cities throughout the United States have now revised their codes to permit the use of the 18,000-pound unit stress.

"The successful operation of the codes using the new unit stress has resulted in great economies for the individuals, builders, and taxpayers of the cities where the new specification has been adopted. The saving made possible by the use of the 18,000-pound unit stress is estimated at from 10 to 12 per cent of the cost of steel entering into the structure. The general adoption of the new unit stress will mean an annual saving of not less than $30,000,000 to the country at large."

With its new standard unit stress steadily gaining ground, and with the code of Standard Practice proving its value, the Institute is ready to enter upon its comprehensive programme for the years immediately ahead. A Standard Manual to facilitate the work of the designer and the draftsman in the execution of the contract after it has been secured is now in course of preparation. A Bureau of Technical Research is being formed. The campaign to bring out the advantages of structural steel and to secure the wider adoption of the 18,000-pound unit stress is being vigorously pressed. Finally, work with students at universities and technical schools is being planned for in the near future.


TEMPORARY WALL
TEMPORARY WALL
BOILER ROOM
AUXILIARY BAY
TURBINE ROOM
SWITCH HOUSE
201.0
138.0
98'6
VALMONT · POWER · PLANT · OF ·
· THE PUBLIC SERVICE CO OF COLORADO ·
EQUIPMENT DESIGNED & PLANT BUILT BY
· LAKESIDE · CONSTRUCTION CO ·
BUILDING DESIGNED BY
· RALPH M KARGER ·

VALMONT POWER PLANT, BOULDER, COLO. PUBLIC SERVICE CO. OF COLORADO.

Designed by Ralph M. Karger.

Valmont Power Station

By Ralph M. Karger

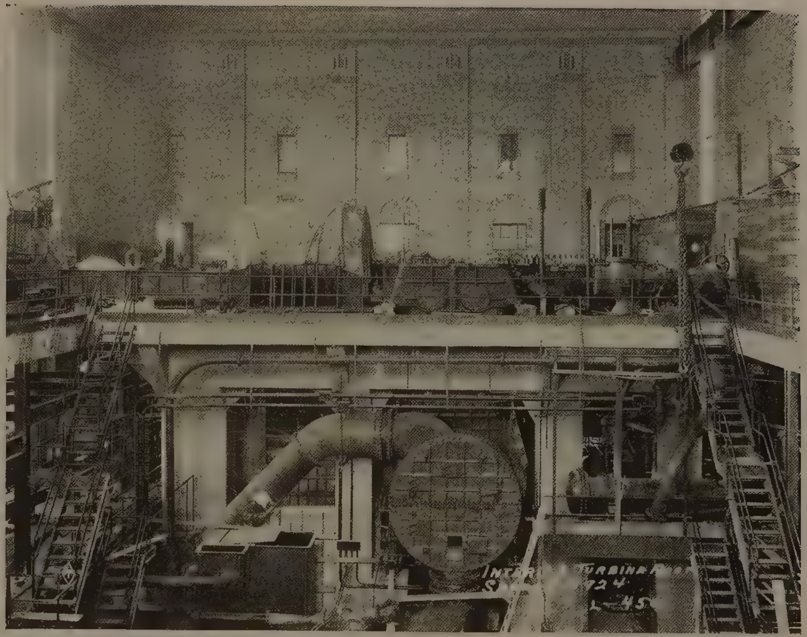
THE Valmont Power Station, situated on the outskirts of Boulder, Colo., a mile above sea level, has a rugged background of snow-capped mountains. Æsthetically, the site is well suited to a building of large scale.

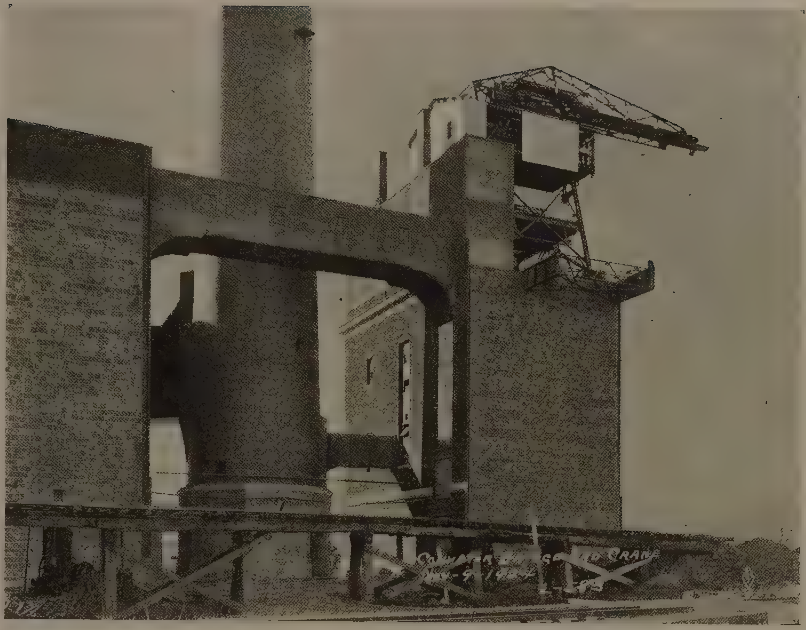
The plant is of the steam-generating type, receiving its condensor water supply from an artificial lake just adjoining the turbine-room. Concrete intake tunnels, surmounted by an esplanade, convey the water into the building. The present installation is comprised of two 25,000 K. W. turbo-generators, the second machine being installed at the present time. This building is the first portion of the ultimate 200,000 K.W. station, which, when completed, will be approximately five times its present size.

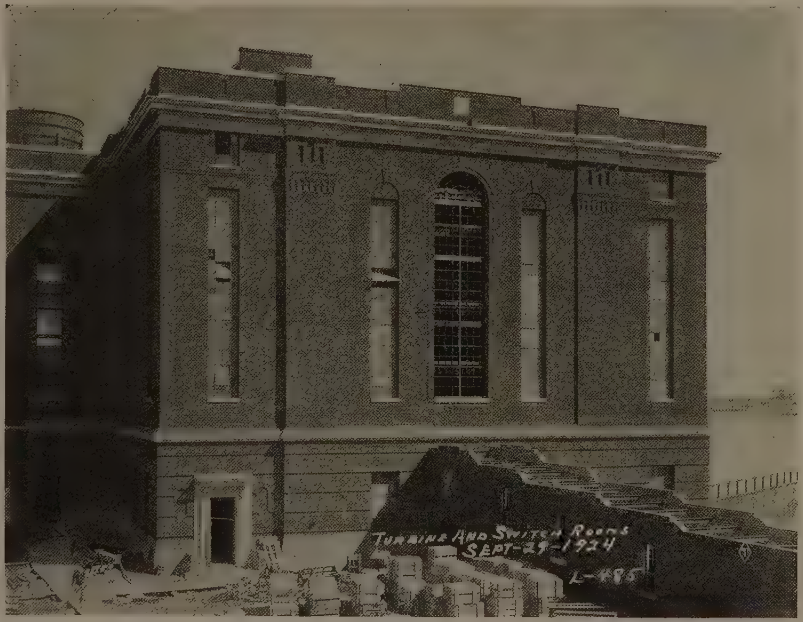
The walls are of brick and self-supporting. Exterior face brick is rough in texture and varies in color from light red to dark blue. Laid in a dark-blue mortar with raked joints, the wall presents an interesting study of light and shade. The exterior trim is of terra-cotta, with a mottled gray-white finish. An an indication of the scale of the building, it may be noted that the belt course is two feet high.

The switch house is five stories high and contains not only the necessary electrical equipment, but also a drafting-room, hospital, laboratory, and offices.

Due to the necessity for future expansion, the building is closed in at the temporary end with a hollow terra-cotta tile wall. When additions to building are necessary, this wall will be removed, one or more generating units will be added, and the building will creep forward to its ultimate size.







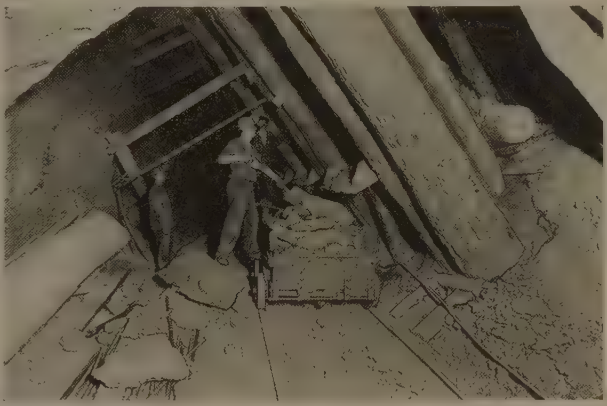
VALMONT POWER STATION, BOULDER, COLO. Designed by Ralph M. Karger.

The Romance of Building

By Richard P. Wallis

FOURTH ARTICLE

AMONG the humbler of the metals entering into the construction of the library we find the element lead. The peculiar properties of this material, its high specific gravity, extreme ductility, and low melting-point, render it of great service in a number of ways. Lead flashings, pipes, caulking, solder, fusible links, cames for leaded glass are all examples of the use of this material in metallic form. We find a large percentage of lead in plate glass, where, like the salesman's mythical raincoat in the "swindle sheet," it's there but you can't see it!



An underground scene in a copper-mine, showing loading of ore into small cars.

Important as are these uses, their value to mankind is perhaps overshadowed by certain of the chemical derivatives of lead that have been developed and are in constant use to-day.

The final decorative effects desired by the architect are usually made possible only through the use of paint. This paint, in addition to the pleasing effect in color and design produced, exercises a potent protective function that preserves and protects the underbody, irrespective of its nature. We are all familiar with the slogan of the paint manufacturers: "Save the surface and you save all." Its utilitarian benefits may be measured in dollars and cents, but the intangible service rendered mankind through the creation of beautiful surroundings in which to work and play is incalculable. The finite expression of the arts and sciences of life is made possible largely through the use of paint.

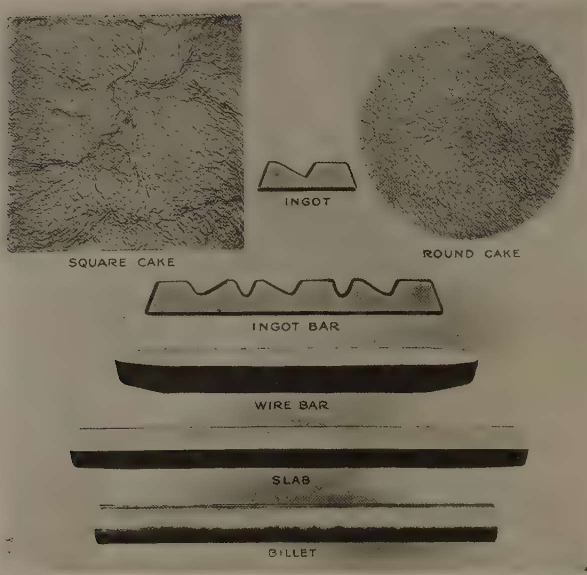
The perfect paint as we know it is a mixture of white lead and linseed oil, to which are added various pigments in order to secure the color effect desired by the architect. The white lead used in this connection is technically known as a basic lead carbonate and averages about 69 per cent carbonate of lead and 31 per cent hydrate of lead. Lead has been utilized for this purpose since the dawn of the Christian era, and much the same process of manufacture is in use to-day as in historic times. As in other manufactured building products, the principal advance has been in obtaining higher purity, greater fineness, and definite control of manufacture. To-day white lead is manufactured by what is known as the "Old Dutch Process"—used by the Dutch during the Middle Ages and inherited by them from the Venetian and Genoese trades of that time. The progress of this material from pit to paint-pot is of sufficient interest to warrant a brief outline of the manufacturing process involved, and is typical of the uses to which chemistry and physics are put in making available for the edification of mankind the raw product of our mines and forests.

Metallic lead is found usually in combination with sulphur as lead sulphate, or galena, so familiar to our amateur radio enthusiasts. These deposits occur over a wide range of territory, but, according to the United States census, the State of Oklahoma leads in the production of this material.

This raw ore is found from five to six hundred feet underground, and great shafts or pits must be blasted out before the lead rock can be obtained. The first process in the utilization of this raw product consists in crushing the ore as mined to the consistency of coarse sand. Once this state is reached it is necessary to extract the earth and other associated impurities that invariably are found in combination with lead. Gravity effects the separation of lead ore and the "gangue," or lighter waste. The "concentrates," as they are now called, are then carefully roasted and smelted to drive off the sulphur, leaving crude lead.

The next step is the separation of the remaining impurities, silver (paradoxically enough), copper, and certain other metals heretofore in combination with the lead. Fragments

Utah Copper Company's mine.



Refining copper in the forms in which it is sold by the producer to the fabricator.

of zinc cast into the molten lead quickly melt and, owing to their affinity for silver, a new and lighter compound is formed, that, due to the difference in weight, floats on top and is thus easily drawn off, after which the silver is reclaimed and becomes a valuable by-product.

Once refined, the metallic lead is cast into pigs about 4 inches by 5 inches by 22 inches and weighing about 90 pounds each. At this point the special process destined to produce white lead is commenced. These pigs are recast in the form of "buckles," so called from a fancied resemblance to the ornaments worn on the shoes of our ancestors of Colonial times. Ten to fourteen of these buckles are placed in a corroding-pot, similar in shape to a flower-pot but with a free cup-shaped space of about two inches at the bottom. Into this rounded bottom is poured about half a pint of weak acetic acid, practically vinegar. The corroding-pots are placed in the stack-house in layers alternating with tiers of spent tan-bark about twenty inches thick—each layer separated from its neighbor by a floor of loose boards.

A typical stack measures about 22 feet long, 20 feet wide, and 30 feet high. It is at this point that the chemical action destined to produce white lead commences. The decomposition of the tan-bark produces sufficient heat—185° F.—to vaporize the acetic acid. These fumes seep upward through the perforations in the buckles, slowly converting the dull-gray metallic lead into a white-lead acetate. Simultaneously the carbon dioxide from the fermenting tan-bark reduces the lead acetate to a basic lead carbonate. Approximately from ninety to one hundred days are consumed in the process, and about 80 per cent of the original lead eventually becomes lead carbonate.

When the stacks are "stripped" this lead carbonate is found, still in the form of the original buckles, but snow white in color and very brittle.

From then on the process consists in reducing this lead carbonate to its final, almost impalpable form by passing it through a series of steel rollers, or "breaks," as they are called. Selective screens separate the coarse particles from the fine until the final break produces a product about the consistency of fine white cornmeal. The rejected portions are reground until practically the entire buckle is reduced to the same fine consistency.

In this form the carbonate is not yet nearly fine enough for use in paint and must accordingly be subjected to additional grinding to reduce it to the specified fineness. Water grinding, as it is called, is the next step in this process of attrition. Huge millstones, in pairs, placed horizontally, grind between them a mixture of carbonate and water until certain of the carbonate is reduced sufficiently to enable it to float on the surface of the water. Here again the fine and comparatively coarse particles are separated by various intricate mechanical devices, the fine particles being passed on, the others returned for additional grinding. The final test for fineness is the ability to pass through a shaker sieve of silk bolting-cloth with meshes so fine that there are 27,000 or more to the square inch. The material not rejected by this last test is conveyed to steam-jacketed pans, there to be dried.

The final step in the preparation of commercial white lead is the addition of a small amount of pure linseed oil. The usual proportion is about 8 per cent oil to 92 per cent lead. This mixing is accomplished in what is called a "chase," in which a millstone weighing a ton and a half thoroughly incorporates these two ingredients.

The white lead is then ready to be packed in steel casks and placed on the market for the painter and decorator.

Open-pit iron-mine.

Typical blast-furnace in operation.

It is interesting to note the diminution in bulk as the manufacturing process proceeds. Roughly, a pound of commercial white lead represents an initial equivalent of thirteen pounds of lead ore.

Were it but possible to devote sufficient space to a discussion of the origin, manufacturing processes, and uses of all of the varied materials employed by the contractor in carrying out the injunctions of the designer a story would result rivalling in interest the most intriguing romance. Kipling, in his yarn "The Ship That Found Herself," has sensed the intense individuality of these inanimate objects and has endowed each with a vivid personality.

The same marshalling together of a host of hitherto uncorrelated elements with the ultimate merging of their individual characteristics into an entirely new entity is no less true of buildings than of ships.

Building is essentially a creative industry and as such is leavened with the individual personalities of those responsible for its success. It represents ineffable co-ordination of thought and effort, and stands as a pre-eminent and lasting monument to human achievement.

Just as the early voyages of exploration and wars of conquest were inspired by the dominant desire for trade control, so is our present-day search for fresh deposits of raw materials. The search to-day for fresh fields for exploitation is conducted by our entrepreneurs in a careful and painstaking manner, made possible only by the scientific advance of the age in which we live, undreamed of by our predecessors. Our tariff feuds and trade wars, while less bloody in their conduct than the almost constant military warfare of a century ago, are waged in a manner no less fierce. Both find their inspiration in the natural struggle of nations to expand and inject new life-blood of trade and commerce into their veins.

Where the Spanish conquistador of the Middle Ages sought gold in the fabled El Dorados of the New World his successor seeks the more prosaic but intrinsically more valuable deposits of coal, oil, and iron, without which a nation is doomed to colorless mediocrity in the concourse of nations.

The geography of building is the geography of trade, and therein lies much of the romance of building.

Front view of open-hearth furnace, charging side.

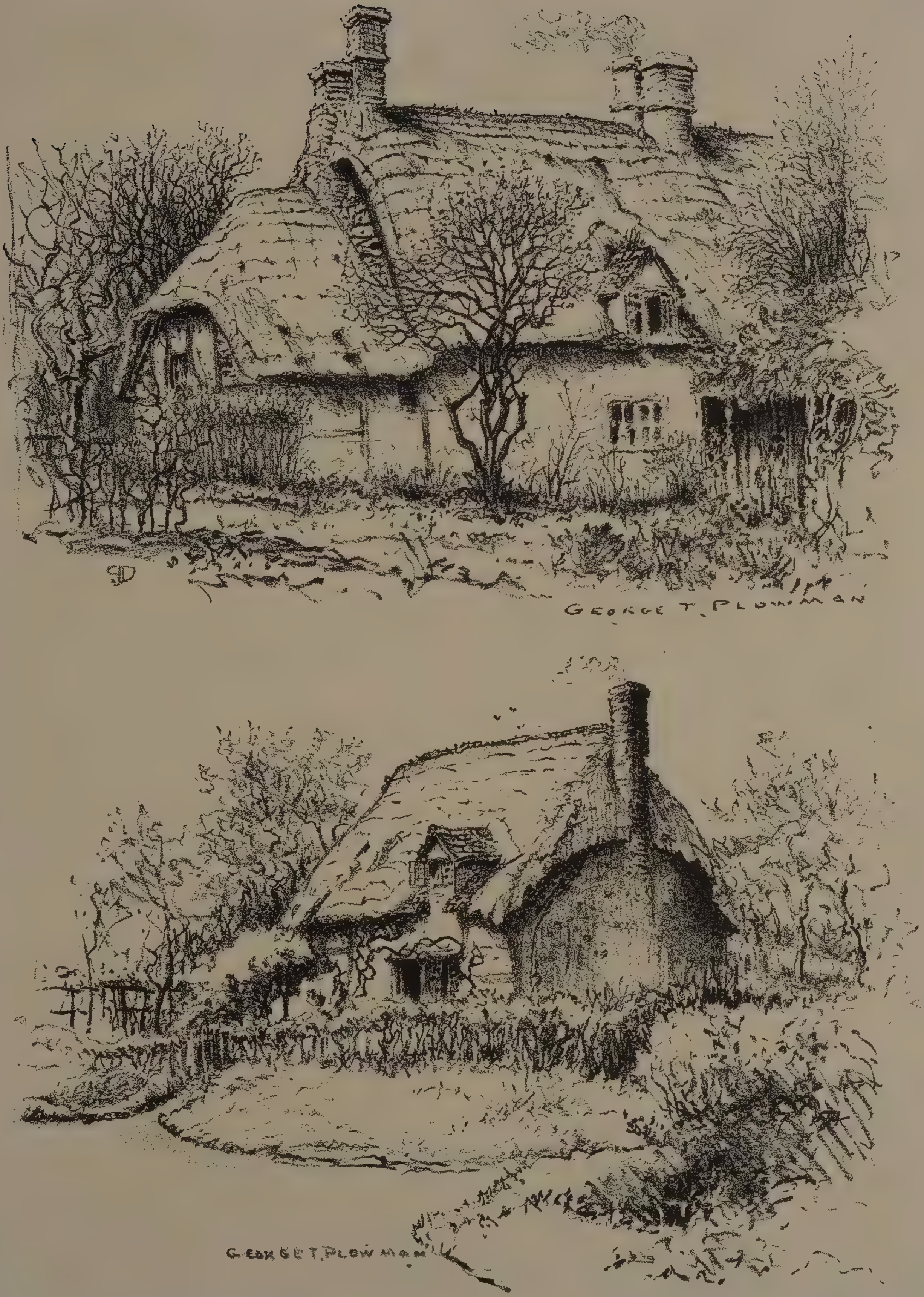
KEY TO CHART SHOWING GEOGRAPHICAL DISTRIBUTION OF RAW MATERIALS. CLEVELAND PUBLIC LIBRARY

SERIAL NO.	MATERIAL	WHERE USED	SOURCE
1	Portland cement	Concrete, mortar	Ohio
1A		Sidewalk lights	Pennsylvania
2	White cement	Face brick mortar	Pennsylvania
3	Keene's cement	Damp-proof plaster	Kansas
4	Hydrated lime	Plaster, brick mortar	Ohio
5	Gypsum	Floor voids, plate glass, cement, plaster	Ohio
6	Crushed slag	Concrete	Local
7	Concrete sand	Concrete	Ontario
8	Brick sand	Brick mortar	Local
9	White sand	Stone mortar	Ohio
10	Silica sand	Sidewalk, plate glass	Illinois
11	Torpedo sand	Sidewalk lights	Wisconsin
12	Rough sand	Plate glass	Michigan
13	Sand	Polished wire glass	Pennsylvania
14	Plaster sand	Plaster	Local
15	Common brick	Back-up and partition	Local
16	Face brick	Court facing	Pennsylvania
17	Fire brick	Boiler arches	Pennsylvania
18	Paving brick	Floor	Ohio
19	Hollow tile	Back-up and partition	Local
20	Guastavino tile	Brett Hall roof	New Jersey
21	Architectural Terra Cotta	Ornamentation	New Jersey
22	Kaolin	Porcelain	New Jersey
23	Ball clay	Porcelain, flint paving tile	Kentucky
24	Feldspar	Flint paving tile	Maine
25	Shale	Quarry tile	Tennessee
26	Slate	Thresholds	Pennsylvania
26A		Electric panels	Vermont
27	Bauxite	Alumdum terrazzo, aluminum	Arkansas
28	Asbestos	H. M. doors, gaskets	Ontario
29	Mica	Electric lights, electric equipment	India
30	Limestone	Concrete	Ohio
30A		Structural steel	Michigan
30B		Plate glass	Pennsylvania
31	Flint	Flint paving tile	Pennsylvania
32	Soda ash	Plate glass	Michigan
33	Salt	Plate glass	Michigan
34	Sulphur	Rubber	Louisiana
35	Chalk	Putty	Great Britain
36	Tokeen marble	Panel boards	Alaska
37	Georgia marble	Exterior masonry	Georgia
38	Botticino marble	Interior, Scagolia, alumdum terrazzo	Italy
39	Travertine	Interior marble	Italy
40	York fossil	Interior marble	New York
41	Nebo golden Travis	Interior marble	Utah
42	Pink Tennessee	Interior marble	Tennessee
43	Clear-face Tennessee	Interior marble	Tennessee
44	Tavernelle Fleuri	Interior marble	Italy
45	Rose Tavernelle	Interior marble	Italy
46	Levanto	Interior marble	Italy
47	Senora	Interior marble	France
48	South American Black and Gold	Interior marble	Uruguay
49	Blue Belgian	Interior marble	Belgium
50	Deep yellow sienna	Interior marble	Italy
51	St. Genevieve golden vein	Interior marble	Missouri
52	Cream A Alabama	Interior marble	Alabama
53	Granite	Steps	Maine
53A		Paving block	Wisconsin
53B		Sidewalk lights	So. Dakota
54	Trap rock	Asphalt tile	New Jersey
55	Magnesia	Pipe covering	Pennsylvania
56	Magnosite	Composition floor	Greece
57	Magnisium chloride	Composition floor	Germany
58	Iron	Structural steel	Cuba
58A		Pipes, ornamental iron, pigments, etc.	Minnesota
59	Lead	Paint pigment, litharge, pipes, flashing, caulking	Oklahoma
60	Manganese	Face brick	Virginia
61	Zinc	Mechanical trades	Oklahoma
62	Copper	Roofing, wire, bronze, babbit metal	Arizona
63	Tin	Bronze, solder, babbit metal	Straits Settlement
64	Mercury	Paint pigment, thermometers	California
65	Nickel	Plating	Ontario
66	Silver	Mirrors	Colorado
67	Gold	Gilding	Colorado
68	Natural graphite	Pipe covering	Ceylon
69	Antimony	Babbit metal	Mexico
70	Chromium	Paint pigment	Russia
71	Cobalt	Paint pigment	Ontario
72	Coal	Plate glass, cinders, paint pigment, tar	Pennsylvania
73	Natural gas	Plate glass, paint pigment	W. Virginia
74	Mineral oil	Lubrication, elevator bumper	Oklahoma
75	Asphalt	Mastic, sidewalk lights	Trinidad
75A		Water-proofing	Mexico
76	Yellow pine	Forms, elevators	Louisiana
77	White pine	Blocking, grounds	Minnesota
78	Oregon pine	Flagpole	Oregon
79	Chestnut	Ribs for copper roof	W. Virginia
80	Oak	Bumpers	Arkansas
81	Maple	Elevator floors	Michigan
82	Cypress	Sinks	Louisiana
83	Bass wood	Toilet fixtures	Wisconsin
84	Cork	Bulletin boards, linoleum	Spain
85	Cotton	Water-proofing, insulation	Texas
86	Flax	Linseed oil, linoleum	N. Dakota
87	China wood oil	Sidewalk lights	China
88	Turpentine	Paint	Florida
89	Copals	Varnish	Zanzibar
90	Castor oil	Heat and ventilating equipment	Texas
91	Hemp	Okum	Philippines
92	Paper	Charts	Ontario
93	Jute	Burlap	India
94	Rubber	Insulation	Brazil
95	Lac	Shellac	India
96	Leather	Leather-covered doors	Texas
97	Glue	Adhesives	Texas
98	Wool	Felt pipe covering	Montana
99	Hair	Plaster	Texas

New York's Pressing Traffic Problems

LOOKING forty years into the future to the year 1965, traffic experts of the Regional Plan of New York and Its Environs predict that the volume of traffic in that year on the twenty-three main arterial highways leading into New York City from the outlying areas in New York, New Jersey, and Connecticut will be from three to three and one-half times the present maximum capacity of those thoroughfares. The estimate of this great increase in vehicular traffic is contained in a 125-page monograph recently made public by the Regional Plan of New York and Its Environs.

Traffic in New York City, states the report, and in particular Manhattan Island, has already reached such a point that the north and south avenues crossing 48th Street will be carrying the limit of their traffic hourly capacity by the year 1930, even though present official proposals for increasing available roadway space are carried out.



COUNTRY COTTAGES IN ENGLAND. From the lithographs by George T. Plowman.

An Architect's Simple Engineering Problems

By DeWitt Clinton Pond, M.A.

TWELFTH ARTICLE

THE use of concrete in the last few years has become more and more universal, until almost all foundation walls are built out of this material, no matter how large or small the building may be, and of course large reinforced concrete buildings are built for factory, warehouse, and certain commercial purposes everywhere. It is unfortunate that more artistic uses are not made of this material. It is the author's opinion that as wood becomes more expensive concrete will be used for residential purposes and architects will see that houses of Spanish or Italian design can be built both beautifully and permanently of concrete. This, perhaps, is a rather long look into the future.

As a material for supporting walls, piers, or columns concrete, plain or reinforced, is a particularly suitable material. Whereas the New York Building Code allows a compressive stress on brick masonry in Portland cement mortar of 250 pounds per square inch and on rubble stone in cement mortar of 140 pounds per square inch, concrete, mixed in the proportions of one part cement, two parts sand, and four parts broken stone, is allowed 500 pounds per square inch. When reinforced the allowable stress increases much beyond this, as will be shown later.

Concrete columns may be reinforced in three ways. These are shown diagrammatically in Fig. 23. The most common method of reinforcing concrete columns is to place in them vertical rods which are held in position by hoops of ties placed not more than one foot on centres. This is the type of reinforcement used where loads are not particularly heavy or where the area of the column may be comparatively large without interfering with the architect's plan. Exterior columns in large buildings are usually reinforced in this manner. The New York Code can be regarded as a very good text-book on concrete design, and most of the following calculations will be based upon the requirements given therein. The type of column referred to above is referred to in the Code as a column "with longitudinal reinforcement only." This may have "not less than one-half nor more than 4 per cent of vertical reinforcement secured against displacement by ¼-inch steel ties placed not farther apart than 15 diameters of the vertical rods nor more than 12 inches." The allowable load on such a column may be determined by allowing "500 pounds per square inch on the concrete, plus 7,500 pounds on the vertical steel." By referring to this there should be but little difficulty in designing a reinforced concrete column.

Assuming a 14-inch square column is to be used, then the area of the column will be 196 square inches. It is possible to use as little as ½ of 1 per cent of steel reinforcement and therefore, as steel is more expensive than concrete, only this amount will be used, which is .98 of a square inch of steel.

If the concrete alone were used and the usual compression value of 500 pounds were allowed, the bearing value of the column would be 98,000 pounds. However, there is an additional load which may be placed upon the column because of the steel reinforcement. The allowable load on the steel is 7,500 pounds per square inch, as stated above, and if 500 pounds, which is allowed to the concrete, is deducted, then the net additional load carried by the steel may be considered as 7,000 pounds per square inch.

$$.98 \times 7{,}000 = 6{,}860 \text{ pounds}$$
$$98{,}000 + 6{,}860 = 104{,}860 \text{ pounds}$$

The total load that the column will carry is slightly over 52 tons. For the type of work which an architect may have to design the loads carried by such columns are often much more than the actual load that will rest upon them. Just the knowledge that a 14-inch column will carry a load similar to the one determined above will enable him to judge the bearing capacity of the ordinary columns he may have to place in a small building.

There are several items that must be kept in mind with regard to such columns. No columns can be made less than 1 foot square nor can the diameter—or least dimensions of a rectangular column be less than one-fifteenth of the height. Not often do conditions arise where an architect would have reason to violate either one of these rules.

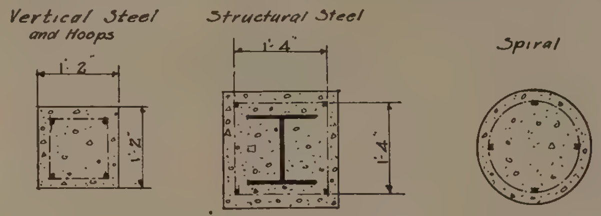


FIGURE 23

Another consideration is that more steel may be used and a richer mixture of concrete in case it is desirable to keep the size of the column within certain limits established by architectural conditions. With regard to the richer mixture the allowable stress in the concrete may be increased to 600 pounds if a "one, one-and-a-half, three" mixture is used or 20 per cent more than the allowable stress given above. In this case, however, the allowable stress in the steel must be reduced to 7,200 pounds per square inch.

In case the richer mixture were used in the problem given above, the load would have been determined in the following manner:

196 sq. in. at	600 lbs. per sq. in. =	117,600 lbs.
.98 " " "	6,600 " " " " =	6,468 "
Total........................		124,068 "

The 6,600 pounds allowed to the steel was found by deducting the unit stress in the concrete—600 pounds—from the unit stress in the steel—7,200 pounds.

In case 2 per cent of steel were to be used, then the area of the steel would be 3.92 square inches, and the steel would be considered as carrying 25,872 pounds, and the total load that the column would be allowed to carry would be 143,472 pounds, or nearly 72 tons. By increasing the area of the steel still more an even heavier load could be carried but the percentage must not be increased to more than 4 per cent. In order to make up the vertical steel that would be required in the column having ½ of 1 per cent of steel, four ½-inch square bars would be required and the hoops would have to be placed 7½ inches on centres.

Few architects who do their own engineering work have occasion to design supports to carry much more than the loads given above, but there may be problems encountered which would require a different kind of reinforced concrete column. One of the chief objections to reinforced concrete buildings of greater height than ten stories is that the columns become very large throughout the lower floors. This may be overcome if structural steel shapes are used to reinforce the supports. As a matter of fact, there might be conditions in which columns of this type might be smaller than steel columns which are properly fireproofed. Recent tests have proven that three inches of fireproofing around structural steel makes an almost perfect protection, while the usual two inches sometimes fails before the fire that surrounds it is extinguished. If structural steel columns are designed on the basis of calculations given in the last article, so that the unit stress is about 12,000 pounds, and if 3 inches of fireproofing protects the steel, the actual outside dimensions of a structural steel column designed and protected in this manner will be only a little smaller than a concrete support reinforced by means of a Bethlehem H section.

A support of this type is referred to in the Code as a structural steel and concrete column. The steel must be "thoroughly encased in concrete not less than 4 inches thick and reinforced with not less than 1 per cent of steel." On such a column the allowable load may be "16,000 pounds per square inch on the structural steel." It can be seen from this that the concrete that encases the steel is supposed to provide such stiffness that the structural steel may be given its total compressive value, and no allowance is made for bending. In order to do this the concrete is reinforced by rods and the required percentage is found by dividing the *volume* of the reinforcing steel by the *volume* of the concrete enclosed by it. This may need a little explanation.

Suppose a condition is assumed in which a 12-inch, Bethlehem H section, weighing 79 pounds per foot, is encased in 4 inches of concrete. The area of such a section is 22.94 square inches, and the supporting value of such a column is 22.94 × 16,000 = 367,040 pounds, or 183.5 tons.

The reinforcing steel must not be placed nearer than 1 inch to the structural steel or the outer surface of the concrete. Usually it is placed 2 inches back of the face of the concrete, so the rectangle of concrete enclosed within the reinforcement will measure 16 inches by 16 inches (Fig. 23), and the area of this square is 256 square inches. From this the area of the column must be deducted:

$$256 - 22.94 = 233.06 \text{ square inches}$$

One per cent of this area is 2.33 square inches, which must be made up of ties and vertical reinforcement. With regard to this the Code states "not more than one-half of the reinforcing steel shall be placed vertically." In any section one-half of the required *area* will be 2.33 ÷ 2 = 1.16 square inches. In a foot of heights the *volume* of the reinforcement shall be 1.16 × 12 = 13.92 cubic inches of steel. If ⅜-inch square bars are used for hoops, the area of each bar will be .1406 square inches. The length of steel required to make a hoop will be 4 × 16 = 64 inches, and the volume of steel in each hoop becomes 64 × .1406 = 9.0 cubic inches. Now there are 10.44 cubic inches of steel needed if the volume of the hoops is to equal the volume of the vertical reinforcement. So in every foot of height there must be 10.44 ÷ 9.0 = 1.16 hoops, which should be spaced 12 ÷ 1.16 = 10.03 inches on centres. The chances are that the concrete will be reinforced more than necessary, as ½-inch square bars will be used vertically and hoops made of ⅜-inch bars will be spaced 10 inches on centres.

To determine the area and volume of the reinforcement for such a condition requires no small amount of figuring, but to find the actual supporting value of a column of this type is a very simple matter.

The method of using the full compression strength of steel when encased in 4 inches of concrete is very useful when it is necessary to strengthen columns in a building on which an additional floor is to be placed. It is a comparatively simple matter to take down the existing fireproofing around a column and encase it with 4 inches of reinforced concrete. The additional strength gained in this manner is often enough to make the addition of another story possible.

A third type of reinforced concrete column is one in which spirals of steel are used to restrain the concrete within them and in this manner to give additional strength to the concrete. Supports of this type are very common in large concrete buildings, as the area of such columns is very much smaller than those in which vertical reinforcement is used and the cost is comparatively small as compared with those reinforced by structural steel. However, the buildings in which columns of this type are found are of a kind that should be designed by engineers throughout, and an architect who only develops simple parts of his structure should not attempt to design supports of this character.

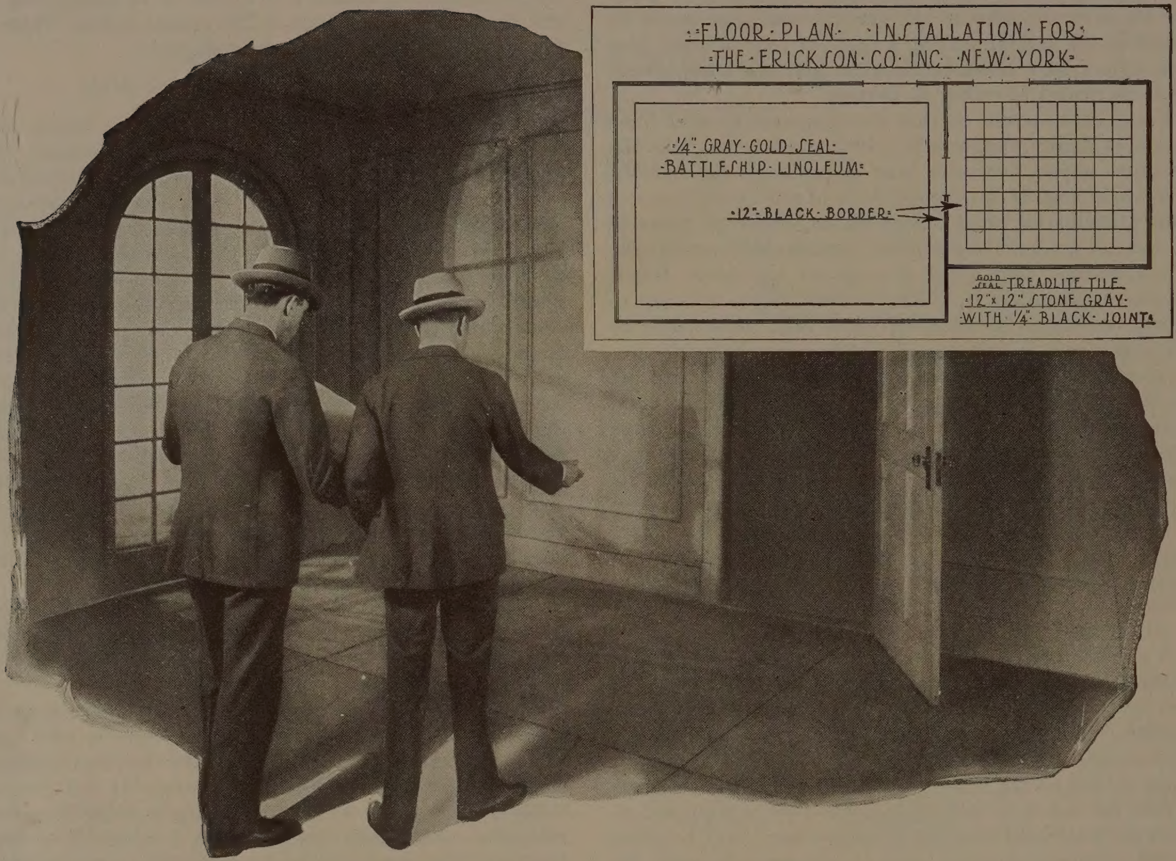
THE END.

Power and Mechanical Engineering Exposition

THE Fourth National Exposition of Power and Mechanical Engineering will be held in the Grand Central Palace, New York, from November 30 through December 5, 1925.

The Power Show, as this exhibition is styled, is an important clearing-house of information for the executives and engineers of all industries. In this it is different from the exhibitions devoted to the equipment of a single industry, as power is a fundamental factor in every industry, and a showing of the machines and apparatus required for its economical generation and use gives an opportunity to every industrial executive to discover some means of cutting his promotion costs.

At the coming show a series of exhibits of heating and ventilating machinery will form an important addition to the lines usually represented. This broadening of the scope of the show is an acknowledgment of the increased importance that manufacturers now attach to the need for modern methods of heating and ventilation in the factory. The heating and ventilating problem is closely allied to the power problem of an industry, and the advances in one art are generally applicable to the other. This innovation at the coming show will, therefore, increase its value to the visitors, who will find much of real worth in the exhibits of all phases of the heating and ventilating art.



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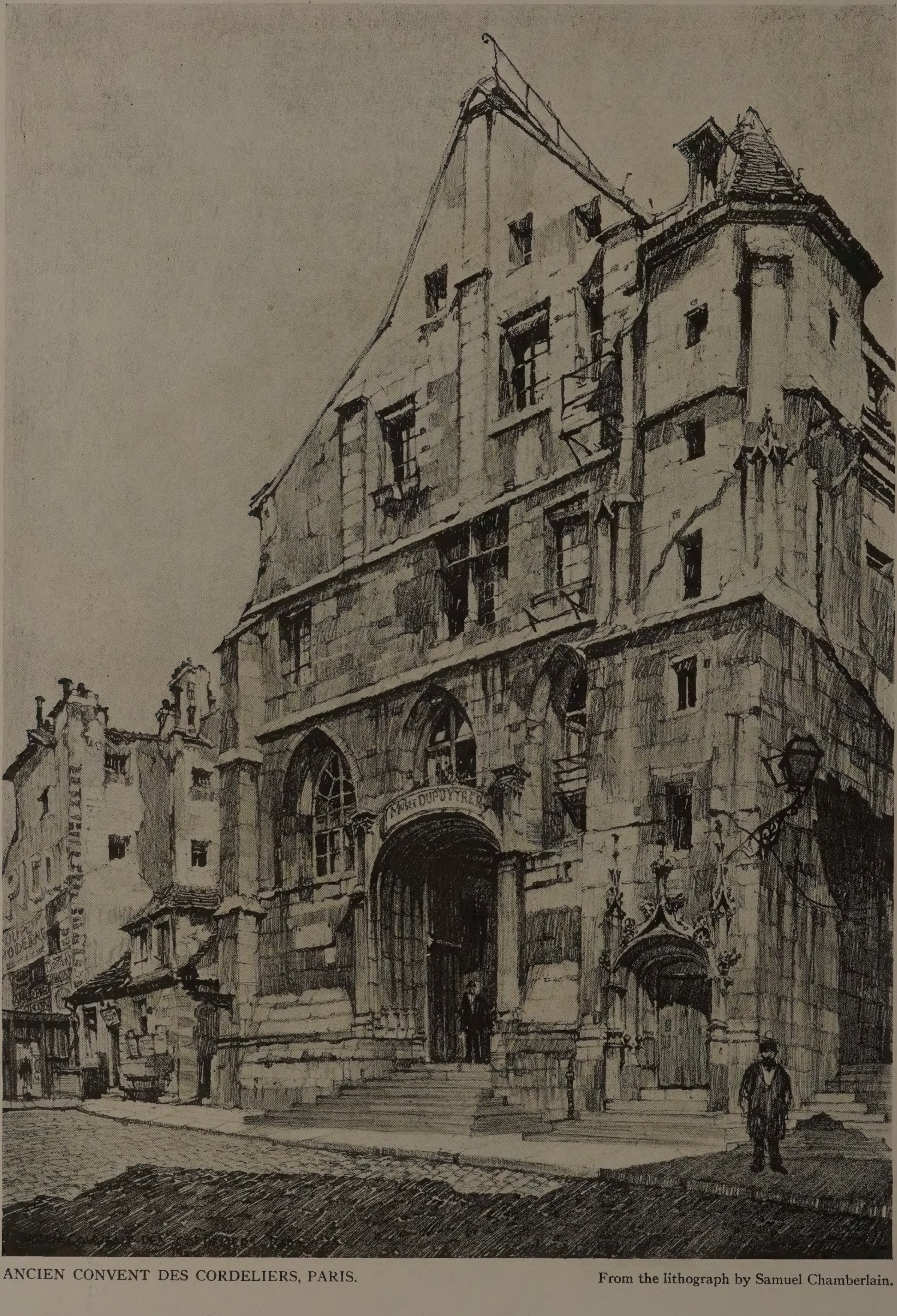

ANCIEN CONVENT DES CORDELIERS, PARIS.

From the lithograph by Samuel Chamberlain.